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Revised Italian Energy Plan for the Eighties



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WEST EUROPE REPORT

No. 1872

REVISED ITALIAN ENERGY PLAN FOR THE EIGHTIES

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[Revised National Energy Plan submitted to the Interministerial Committee for Economic Planning on 7 August 1981 for decision. For further details, see JPRS 77855 of West Europe Report No. 1735 dated 16 April 1981 "Energy Economics: Italy's National Energy Plan for the Eighties."]

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The new National Energy Plan, whose complete text we are publishing, was submitted to the Interministerial Committee for Economic Planning (CIPE) on 7 August 1981 by Senator Giovanni Marcora, minister of Industry.

It is a question of the revised and corrected text of the plan submitted in his time by Minister Bisaglia in the first months of 1980, subsequently reduced and supplemented with four appendices

by Minister Pandolfi, which was already submitted to CIPE on 26 June 1981 and is now definitively completed and put in final form by Minister Marcora.

The present document will be the subject of a decision by CIPE, just as was true of the previous plans, the ones for 1974-1975-1977. It will also be discussed by the Senate and Chamber Industry Committees.

This plan has already been forwarded by Minister Marcora to industrialist and labor union organizations to hear their possible remarks.

Reasons for a New Plan

1. The present National Energy Plan repeats in substance the version prepared in November 1980. The most important variant is represented by a downward adjustment of the quantitative objectives for 1985 to 1990 pertaining to the total demand for energy, in view of the trend of demand in the last 2 years and of the more updated estimates concerning the probable values of its trend elasticity. Moreover, four appendices devoted to the plan's feasibility factors have been added.

They express the result of 5 months of work and represent a specification of certain programmatic actions.

Appendix A contains the list of options for major energy installations. In it, the government indicates to the regions, in the light of the results emerging from the recent survey and consultation phase, alternative possibilities for locating large coal-fired and nuclear powerplants, within the scope of which the regions will be responsible for making determinations under their competence.

Appendix B includes the decisions concerning construction of nuclear powerplants for the present decade made jointly, under government incentive, by ENEL [National Electric Power Agency] as general purchaser and architect, by CNEN [National Nuclear Energy Commission] as industrial development agency and safety and inspection authority, by the industry represented by system and first level component suppliers, by Nuclear AGIP [National Italian Oil Company] as fuel supplier.

Appendix C contains logistics guidelines for installing coal-fired powerplants on national territory, with an initial outline of basic infrastructures.

Appendix D, finally, concerns measures in progress for putting the already built Caorso powerplant in commercial operation in 1981, in order to achieve the urgent objective of increasing available power for the 1981-1982 winter season.

2. The response given by Italy to the problems brought up by the worldwide energy crisis has been inadequate, on the whole, up to now. In comparison with the response made by other industrial countries, Italy's situation is tending in time to become more critical. A trend reversal is necessary, in order to make the 1980's a decade of vigorous recovery. That will be possible, if a number of actions are implemented rationally by a number of agencies. The new National Energy Plan represents the frame of reference for those actions.

3. Energy plans have become the general rule in response to energy difficulties internationally and in many countries, although with the differences due to the diversity of systems and purposes.

4. Starting in 1973, when the first sharp increase in the real price of oil occurred, a new transition of the world's energy system began, transition from oil. This transition will be completed when, in a few decades, oil has ceased being the leading source of energy. Two other adjustments occurred in the last two centuries: the first one, from renewable energies to coal; the second, from coal to oil. These adjustments were motivated primarily by factors of economic expediency with a shift from a more expensive fuel to one less costly and with progress in efficiency and ease of use. The third transition is in progress. Abandonment of oil is determined once more by the cost advantage of alternative sources to oil, especially nuclear energy and coal and by their greater availability, although the use characteristics of the new sources of energy appear to be more complex. It is likely that, on completion of the new transition, it will be possible to replace the dominant function of oil with a balanced function of several sources of energy.

5. As early as 1973, international agencies--UN, IEA, EEC--indicated the transition methods and times in progress and recommended that the member countries make the necessary determination for the purpose of promoting transition.

6. During the last 2 years, coinciding with the conflict between Iran and Iraq, which confirmed the traditional political instability of that geographic area, the difference in price between the use of oil and of alternative sources of energy became pronounced. This circumstance stimulated industrial countries to reduce the time of the third transition by making early choices that they would have made later.

7. The requirement for an updated energy plan stems from the characteristics of the new energy situations created in the world and from the evaluation that, in the state of updating of the previous energy plan, prepared on the bases of data furnished by Parliament during the debate on 3-6 October and approved by CIPE in December 1977, insurmountable delays have accumulated in certain important sectors, like, for example, the sector of locating and constructing new powerplants.

8. Energy, a critical resource of countries with a high degree of industrialization like ours, depends on a large number of variables, some of which are beyond national control. In turn, energy intersects a large part of the sectors in which the economic system is organized, affecting them. Moreover, it goes horizontally through industrial policy, from the side of demand to the side of supply, the policy of the territory and environment, the policy of development in the broad sense. A high degree of complexity of the choices making up the energy policy is derived from it. In order to overcome the serious risks of spontaneous dynamics, the choices should be guided by an integrated logic that will take into account the nation's needs, the technological opportunities of the market, the political, economic and social connections.

9. The decision-making system that supports the energy policy is, in a situation of pluralistic democracy, like ours, extremely coordinated. A clear specification of roles is needed. The problem is raised of aggregation of consensus and among

a plurality of agencies. The plan is the instrument for achieving, although interwoven with responsibilities, effectiveness in the decision-making process, consistency with broader guidelines and decisions pertaining to development of the country's economy and progress of the civil society.

10. The time span that measures in the energy sector, the interval between decisions and achievements is particularly long. The connection derived from it is all the more acute in Italy's case in view of the gaps to be filled and delays to be made up. Coordination of actions to be taken in many areas for immediate operations with long-term effects determines the requirements for strategic programming.

11. Therefore, it is necessary for the government to have an instrument, the National Energy Plan, that will propose the following objectives in updated terms, and with direct operational projections:

Make possible a joint responsible involvement of political forces, social parties and the civil society and create a consensus on the guidelines and specific choices with regard to energy, also with reference to their overall implication on production and income distribution, on consumption patterns, on the quality of life.

Obtain Parliament's approval of the lines of development to be pursued in the field of energy.

Guide investment decisions by public agencies and economic operators in a framework of compatibility and synergy with the nation's energy strategies.

Represent, with regard to the European Community countries of the IEA, the country's desire in energy matters, also in view of measures pertaining to aids, incentives and joint initiatives.

Finally, give international financial agencies a demonstration of the country's reliability concerning its capability of working to adjust energy production to the requirements of the nation's economy.

12. The structure adopted for the plan is in accordance with a logical sequence consistent with its objectives. The plan brings to light the critical role and the important function of energy and especially the connotation taken by energy, in our country, pertaining to its increase options. It singles out the objectives to be attained in the framework of the challenges that Italian society and its industrial system must face in the next decade. It contains estimates of the amount of demand, reflecting in turn the effect of finalized actions on its rationalization in terms of energy consumption. It correlates with these estimates the relative contribution of the various energy sources to total supply, evaluating their economical and attractive aspects. It prepares specific guidelines for the individual energy sources with an indication of the principal courses of action and of the corresponding feasibility conditions. It evaluates, in an initial approximation, both the financial resources needed for investments in fixed assets, infrastructures and incentives, and the physical variables pertaining to plants, technologies, products, and, finally, human resources, knowledgeable and managerial.

13. The plan covers the 1981-1990 decade. For the objectives to be attained in the first 3 years, it is closely tied to the Medium-term Plan. It takes its guidelines, derives the amount of spending for the 1981-1983 3-year period from it and it is a sectoral detailing of it. The reason for the time length of the PEN [National Energy Plan], longer than the medium term generally used in economic policy programs, is primarily tied to the time needed for significant variations in the supply of energy, especially in the form of electricity produced by nonconventional powerplants. Moreover, not much shorter times are required for changes and conversions in the industrial system for purposes of reducing energy consumption.

14. In view to the length of time involved, the high degree of uncertainty characterizing the energy situation starting with its worldwide variables, the large number of objective and subjective factors of which the network of the energy situation consists require the plan to be flexible in its organization and fluid in its validity in time. Far from being a rigid set of expectations and preceptive determinations, the plan is, therefore, intended to be a modular instrument, capable of being adapted dynamically to new frameworks of evaluations, needs, opportunities, connections. As a reference pattern, it will be like a supervision instrument, making possible a constant comparison between the actual progress of the actions and the original forecasts. A natural cadence of organic revision of the plan coincides with the periods of 3-year planning, which is the cadence stated in the 1981-1983 Medium-term Plan. Annual checks will be made of the state of progress of the plan in accordance with the guideline that recently found legislative support with regard to ENEL's programs, with article 2 of Law Number 309 of 15 June 1981,

15. Once the consultation and discussion time has ended and CIPE's approval has been obtained, in accordance with the same procedure followed for the Medium-term Plan, the National Energy Plan will display its effectiveness in the decision-making process and in the behaviors of the various agencies. It will have direct effectiveness on decisions by the government by public administration. With regard to the energy agencies, ENEL, ENI [National Hydrocarbons Agency], CNEN and the respective programs adopted with autonomous responsibility for formulating, the plan will have indirect effectiveness, primarily through the guiding power of CIPE and the directive power of the minister of Industry. With regard to the regions and the local authorities, with the exception of decisions peculiar to the national legislature, the plan will have value as a frame of reference within which decisions of respective competency will be incorporated. With regard to private economic operators, the plan will provide guidelines on modification of energy supply and on actions and incentives concerning demand.

Energy and Development

16. The basis on which the strategy indicated in the present plan rests is the correlation existing between energy and development; more specifically, the conditioning exercised by solution of the nation's energy problem on the country's growth possibilities and rates.

17. The two oil crises in 1973-1974 and 1978-1980 had a profound effect on the course of the world's economy. Their fundamental variables--prices, income, employment, balance of payments--were affected. The real price of energy, affected by the price of oil, quadrupled during the first crisis and doubled again during

the second one, rose rapidly, with the exception of a situational decline that occurred before the second crisis. The increase in the average price of oil was followed by a process of realignment of the prices of nonoil sources of energy. The rates of adjustment for the individual prices were uneven, with a resultant increase in the spread of relative prices.

18. In 1980 and in the first half of 1981, a reduction in oil demand occurred in consumer countries. That gave rise to a situation of abundant supply favored also by Saudi Arabia's production policy. Consequently, a downward adjustment of the highest crudes on the international markets was decided on. Special circumstances contributed to this development: lower consumption in a specially favorable winter season, increase in oil production in non-OPEC areas, economic recession in most of the OECD areas, sharp rise in the dollar the currency in which international oil transactions are performed. In addition to these circumstances, the reduction in demand for oil also resulted from the effects of policies of replacement with other sources and of energy conservation causing appreciable reductions in energy/income elasticity to be recorded.

19. Forecasts on the future trend of oil prices and on the stability itself of supplies are difficult. Much will depend on political events like the situation in the Middle East, continuation of Saudi Arabia's price-control role, reestablishment of a line of cohesion in OPEC. Much will also depend on technical events, like the finding and availability of new reserves in OPEC and non-OPEC areas. It is true, however, that the consumer countries will for many years still be in a situation of considerable dependency on oil. In this situation, it seems wise to maintain as a basic assumption at least a nonreduction in the real price of energy and, therefore, the permanency of the problems raised dramatically by the two major shocks that occurred in the past decade. This was also the opinion expressed in the ministerial meeting of the IEA, in June 1981.

20. The individual countries have undergone the effects of the above-described situation in different ways. In general, the vulnerability of the individual economic systems was and still is all the greater the greater the dependency on imported energy, especially the importation of oil.

21. Although Italy shows a very low annual per capita energy consumption (2.60 tons of oil equivalent, compared with 3.86 tons of oil equivalent on the average in the EEC, including 3.65 in France, 3.95 in the United Kingdom, 4.64 in the Federal Republic of Germany, and an average of 5.08 tons of oil equivalent in OECD), it is in a critical situation, from this point of view, that can be summarized with the following data:

The total consumption of energy developed in the last 25 years at an average rate of 6.7 percent, increased from 29.3 million tons of oil equivalent in 1955 to 146.9 in 1980.

Energy dependency on imports equals 82.7 percent (oil 58 percent, coal 85 percent, methane gas 55 percent); second among the most industrialized countries after Japan.

Oil covers 67 percent of the energy requirements, compared with an average of 55 percent for the EEC and an average of 51 percent for OECD.

Oil imports heavily burden the balance of trade (\$10.5 billion in 1979, \$19.3 billion in 1980 and an estimated \$24.4 billion in 1981) and they contribute preponderantly to causing a negative balance.

22. This results in a situation of exceptional vulnerability for Italy. With some oversimplification, Italy's economy can be described as structurally one crop from the point of view of demand for energy, especially the demand for oil. It is at the mercy of the trend and prices of the world's supply of oil. This situation is symmetrical with the one observed in one-crop economies at the mercy of the trend and prices of world demand. For Italy, the energy factor is a heavy factor affecting economic development. The main quantities in our economy are strongly affected by it: inflation rate, balance of payments, income, employment.

23. The inflationary effect of the increase in the price of oil shows up directly and indirectly. The direct impact is proportional to the importance of the oil sector in the economy and immediately reflects the increase in the price of imported oil. Variations in the exchange rate, also caused by the same oil shock, can make the price increase worse at the origin. Moreover, past experience shows that prices for other energy products follow the trend of oil prices, although with some delay and only partial adjustments. The indirect effect on domestic price levels is tied to the intersectoral repercussions and, especially in the case of Italy, to the indicator mechanisms that provide vehicles for rapid propagation of foreign inflationary stimuli to the domestic price system. It is possible to estimate, with sufficient approximation, the overall inflationary effect exerted on Italy's economy by a given increase in the real price of oil, calculated on the international prices of manufactured goods. It is estimated that an inflationary impact of 20 percent corresponds, in a span of 3 years, to a 100-percent increase in the real price of oil, taking the most reliable assumptions concerning the reaction of international prices for manufactured goods to the same increase. This impact can be mitigated and deferred by a fiscal policy that enables final energy consumption prices to have more restrained increases in comparison with import prices.

24. The effect on the balance of payments stems from a deterioration of the exchange rates. There also are more complex secondary effects. The decrease in imports of other commodities owing to a slowdown of domestic production activity is added to the reduction in oil imports in real terms, resulting from the conservation and substitution policy. Nevertheless, if the world economy as a whole goes into a recession, exports are also reduced. Finally, with an intensification of domestic inflation, export prices also begin to rise, thus compensating in part for the initial deterioration of exchange rates. Experience of the two oil shocks in the past decade has shown that the response of industrialized countries found expression in a short-lived improvement in the real balance of trade, an improvement, however, compensated by far by a worsening of exchange rates. This seems to be the most likely response also in the future, especially if the price of oil is tied to some form of indicator in accordance with OPEC's proposals. The structural worsening of the foreign connection remains as a sure, constant fact for the case of Italy.

25. The effect on income is also tied to the deterioration in exchange rates. The loss of income directly reflects the increase in oil billing. The inflationary effect on the world's economy is added owing to the fact that the oil producing countries are not able to spend their greater income immediately. The first oil

crisis in 1973-1974 exploded a recession trend, already present in embryo in the world economy, in the serious recession of this postwar period. Enterprise operators reacted by cutting investments in fixed capital and circulating capital, as a reaction to the financial deficit owing to an increase in raw material prices and the cost of labor faster than the increase in prices for finished products. With some variants, the phenomenon was repeated at the time of the second crisis. In Italy's situation, the phenomenon found a specific manifestation. Penalization of our growth tends to be amplified in an economy with a high level of exports by the repercussions of the worldwide recession.

26. The effect on employment is reflected in a slowdown of production activity. In the recession phase, this slowdown affects the fall in productivity growth rates more than employment levels. But it is known that over the long run employment can increase only with an increase in the real product between 3 and 3.5 percent a year. This kind of growth rate is seriously jeopardized by recurrent energy crises. In our case, it is further jeopardized by insufficient national responses to crises of outside origin. Processes of development of tertiary sectors in the economy and of shifting, within the industrial branch, to sectors with less energy intensity may attenuate the negative repercussion on employment. But the shape of the problem in general is still that of a constant threat.

27. The connection stemming for our economic growth from the energy factor prove, therefore, to be rigid and severe. That is true in an absolute manner, but it is also true in terms of relative positions of our economy with regard to other industrial economies.

28. The average cost of electricity is an important component in the costs of production. It is higher in Italy than in all the industrial countries competing with us on the international market. Even disregarding the almost full utilization of hydroelectric resources, the high incidence of fuel oil, compared with more economical sources like coal and nuclear energy, makes the electricity produced in Italy more expensive than the electricity produced in competing countries. This results in jeopardizing the ability of our industrial system to compete in the future. Aside from production using very much energy for which a question of survival is now shaping up, there are many sectors dangerously exposed. Credibility of general recovery programs in sectors like iron and steel making and the chemical sector is tied to the ability to start simultaneously solving the energy problem toward electricity in sufficient quantity and at costs gradually brought down to international levels.

29. Therefore, an energy policy is necessary to decondition our economic growth. That involves proceeding beyond the responses of spontaneous adjustment that Italy's economy has expressed in past years.

30. Adjustments in the demand for energy have already been observed. The average elasticity of energy demand in comparison with the gross domestic product has decreased appreciably since the first oil crisis. This quantity was 1.27 in the 1965-1972 period. In the subsequent period, it took on variable and definitely lower values. Excluding the years from 1973 to 1975, characterized by situational fluctuations of considerable size both for the gross domestic product and for the consumption of energy, we have an average value of about 0.6 for elasticity in

the 1976-1979 period. This fact reflects not only the improvements achieved in efficient use of energy, but it also results in a reduction of activity in sectors with high energy consumption, met in some cases by recourse to imported product.

31. Likewise, with regard to supply, a planned, coordinated response is needed, much more than it was possible to make in past years. That is true of supplies, but it is still more true of a basic sector like the supply of electricity, in terms of amount needed to satisfy demand and in terms of the various composition of the primary sources used. It is necessary to go from a situation still characterized by insecurity in oil supplies and from a supply of electricity subject to interruptions in critical periods of the year to more orderly and guaranteed overall conditions.

32. The energy-development correlation is a fact that lies in the reality of things. But it is a determining factor for it to be perceived by the political class, by public administration, by civil society through a widespread energy awareness in the country. Precise awareness that the plan's failure or delayed implementation entails weighty negative consequences to economic development and to the standard of living of the entire country will be a determining factor in the plan's success.

Strategy

33. The present National Energy Plan takes, as unifying principles of the actions that will be described analytically below, on the one hand guidelines of a demand policy and, on the other hand, guidelines of a supply policy. It assigns to the overall strategy resulting from this a connection pertaining to the relationship with man and with the environment as permanent, required point of reference of the plan.

34. With regard to energy demand, the orientation adopted in the plan consists in a policy of stimuli and incentives, extensive and organic, simultaneously to saving and to a rational use of energy.

35. In addition to compressing subsequently demand margins characterized by waste, especially in the civil sector, this policy will call for adoption of innovative technologies for the industrial and civil use of energy, for a rationalization of products, services and production processes from the point of view of their energy content, for respect for a balance between users' needs, quality and quantity of goods, costs and prices of supply.

36. In the industrial sector, improvement of energy efficiency will be obtained by means of methods of saving, effective in the short term. In the second place, it will be obtained by replacing existing technologies with new technologies. This second path requires investments in research and is intended for producing results in the long term, entailing modifications of the production process and partial or total replacement of plants. The innovative effort will be concentrated on those sector with the highest energy consumption per product unit. In these sectors the largest savings obtainable will make a more rapid replacement process possible. Replacement will, in fact, be carried out only when the saving of cost per product unit, obtainable with the new methods, exceeds the cost represented by ascribing to the product unit the share of the costs sustained by the innovation.

37. Modification of the production mix will take place on two levels: on the intersectoral level and on the intrasectoral level. The weight on the total of the gross domestic product of the sectors with less energy consumption will be increased by means of intersectoral modifications, to the detriment of the high consumption sectors. Preference will be given within each sector to those products or segments of the production process involving less consumption of energy in comparison with others by means of intrasectoral modifications of industrial production.

38. Two conditioning factors have a bearing on both reconversion activities, intersectoral and intrasectoral. The first one, of an external nature, is represented by the need for improving the balance of payments. Reconversion activities must take into account, however, the trends of international demand and must be oriented toward sectors and products with a higher degree of competitiveness. The second one, of an internal nature, is determined by the production structure existing in the country. It is impossible to disregard the importance and geographic distribution of the physical capital and of the human resources. The human resources are expressed by the manpower distributed territorially and by skills. Any modification policy cannot fail to have a nature of slow adjustment of the actual level to the desired level. The time span will necessarily be long term. The extent of maneuvering will necessarily be limited.

39. A national policy on energy saving and use should, therefore, affect the entire industrial policy as a permanent strategic factor. Experience of the 1970's warns that the critical characteristic of the West's production system tends to be constantly more the capability and velocity of change compared with changing the general conditions of the economy, which include variations in exchange rates, emergence of new industrial countries, the constantly more rapid alternation of expansion and recession, the microelectronic revolution. Traditional type industrial policies, based on long-term sector plans and on easy credit as the only instrument, show their limitations, because they are designed for heavy sector with a uniform product, which usually are the ones with the highest energy consumption. In a world undergoing constant change, this kind of industrial policies actually fall back on predominantly defensive lines, like defense of the employment levels and defense of export quotas. An industrial policy strongly focused on innovation and oriented toward favoring the changes dictated by the energy factor shapes up, on the other hand, as an attack strategy. Thus it will be possible to balance the very necessary defense of the more traditional sectors with encouragement to the modular, flexible development of the industries operating in sectors with a high growth rate of international demand.

40. A priority line for actions to be carried out emerges from all the foregoing. In the short term, incentive to energy saving, encouragement of research and demonstration of new techniques, support of light sectors, actions stimulated by means of appropriate information drives. In the medium term, primarily modification of the intrasectoral mix. In the long term, modification of the intersectoral mix.

41. With regard to supply, the plan's strategy aims at increasing the energy production capacity from alternative sources other than oil. Therefore, the plan assigns the nature of a residual source to oil. Increase in supply from alternative sources should take place at the maximum rate allowed by the progressive expansion

of the managerial capability of Italy's industrial and administrative system, by the time required for constructing plants and infrastructures, by the availability of total financial resources.

42. The contribution of alternative sources to oil should achieve, in the span of the decade, a considerable variation in their relative contribution with sizable increases in the share of coal, nuclear energy and natural gas. But the actions to be carried out should not overlook any of the alternative sources, including renewable energies.

43. Energy production choices should achieve, in the medium term, a satisfactory average cost of energy in Italy in relative terms in comparison with the cost in other industrial countries. This results in a need for constant checking of the development of energy in other countries. Italy's choices will be adjusted concretely to that development, with abandonment of abstract objectives of optimization of the cost of energy.

44. In the second place, energy production choices should involve a reduction, as great as possible, of the import component in the total cost structure of energy. The effect of imports of energy raw materials on the total outward flow of financial resources toward foreign countries has been exceeding the safety level for some time now in our country. This requires extreme determination in use of any, even the slightest, national resource and in modification of the content of imported sources in the direction of combinations entailing a reduction of foreign exchange outlays.

Primary Sources in the Years 1980, 1985, 1990
(millions of tons of oil equivalent)

	<u>1980</u>		<u>1985</u>		<u>1990</u>	
	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>
Solid fuels	12.4	(8.5)	17.7	(10.7)	34	(18.4)
Natural gas	23.0	(15.5)	28.9	(17.5)	35	(18.9)
Crude oil	98.8	(67.2)	105.4	(63.9)	94.4	(51.0)
Hydro-geo electricity	10.9	(7.6)	10.5*	(6.4)	11.6*	(6.3)
Nuclear electricity	0.5	(0.3)	2.0	(1.2)	8.0	(4.3)
Imported electricity	1.3	(0.9)	--	--	--	--
Renewable sources	--	--	0.5	(0.2)	2.0	(1.1)
TOTAL	146.9	(100)	165.0	(100)	185.0	(100)

* In an average hydrological year and with natural contributions.

45. Finally, energy production choices should achieve the highest possible degree of reliability in energy availability. This will be possible by means of a geopolitical diversification of the areas of origin. Recourse will also be required to a balanced plurality in the technologies used.

46. An effective supply policy must take into account the high degree of dynamics in scientific and technological knowledge determined by the present historic transition of the world's energy system. Therefore, it is necessary to support the process of generation, interiorization and application of the results emerging from the continuous process of technological progress. Therefore, the time of research, development and industrial promotion becomes important.

47. The plan's overall strategy and, in particular, the supply policy are subject to an obligation of a permanent general nature. The energy choices must be such that they will, first of all, protect man and his health. Dangers must be minimized; safety and health protection must be guaranteed as variables independent of any energy enterprise. In the second place, the natural environment must be protected. Compatibility with protection of the ecological values must be taken into account among the rules of feasibility. In the third place, energy choices must respect the overall balance of the territory. Especially with regard to large energy plants, the areas of their installation must be brought back into balance, with collateral actions aimed at complete development of the territory.

48. Safety, environment, territory represent the factors on which consensus is based preliminarily. Therefore, they come under the prerequisites for the actions described in the present plan.

49. Consistent with energy strategy guidelines indicated above, next is defined a quantitative assumption to which the programed development of energy supply and demand should lead in 1985 and 1990. This quantitative assumption presents, with regard to demand, figures for the various forms of employment, including nonenergy uses for completeness. With regard to supply, it indicates different figures for each primary source.

50. The values indicated for the halfway point and the end of the decade are significant as quantitative reference objectives. Therefore, they must not be regarded as forecasts, but rather as goals to be reached. In particular, the objective of programed evolution of demand for 1985 and for 1990 must be regarded as an objective. In fact, it must be realized that the production recovery of energy intensive sectors in a state of crisis at present will involve correspondingly greater energy consumption. This makes the scheduled goals especially important.

51. Although they are faced with various degrees of uncertainty, the quantitative objectives indicated take into account a series of conditions of consistency with most important macroeconomic aggregates; compatibility with the technological and managerial resources of the industrial system; congruity with the characteristics and the times of the public decision-making and administrative system; balance, finally, between supply and programed development of demand. The fluid nature of the plan and its periodic updatings will make it possible to adjust the system of objectives little by little. Thus, it will be possible to incorporate in the National Energy Plan the variations that will intervene in factors, on the basis of the world supply of primary sources, which are beyond national control.

52. The quantitative reference objectives provided by the plan are given in tables 1, 2 and 3. They are different for primary sources and form of use and refer in time to 1985 and 1990. In outline form, construction of the tables took place on the basis of quantitative assumptions of programed development of demand for the various forms of energy use. Saving objectives consistent with a more rational use of energy have been calculated, sector by sector, and the formulation of requirements in 1985 and 1990 was arrived at. An average annual growth of 3.5 percent in the decade was taken as an assumption of development of the gross domestic product.

Final Uses of Energy in the Years 1980, 1985, 1990

	<u>1980</u>	<u>1985</u>	<u>1990</u>
High temperature	21.0	21.0	21.5
Medium temperature	7.4	7.5	7.6
Low temperature	29.9	29.4	31.0
Total thermal uses	58.3	57.9	60.1
Fixed electric uses ¹	12.7	16.2	20.8
Fuels (transportation use) ²	26.6	27.9	30.6
Total final uses	97.6	102.0	111.5
Total demand	146.9	165.0	185.0

¹ 860 Kcal per kilowatt-hour

² Excluding bunkering but including fuels for agriculture and industry.

Energy Production per Source in the Years 1980, 1985, 1990 (millions of tons of oil equivalent)

	<u>1980</u>	<u>1985</u>	<u>1990</u>
Imports	1.3	--	--
Hydroelectric-geothermal ¹	10.9	10.5 ²	11.6 ²
Nucleoelectric	0.5	2.0	8.0
Thermoelectric			
Methane	2.4	2.5	2.9
Solid fuels	4.1	6.7	22.4
Oil products	23.0	31.4	23.8
Total	42.2	53.1	68.7

¹ Conversion of kilowatt-hour on the basis of 2,200 Kcal per kilowatt-hour.

² In average hydrological year and from natural contribution.

Final Uses of Energy in the Years 1980, 1985, 1990 (millions of tons of oil equivalent)

	<u>1980</u>	<u>1985</u>	<u>1990</u>
High temperature	21.0	21.0	21.5
Medium temperature	7.4	7.5	7.6
Low temperature	29.9	29.4	31.0
Total thermal uses	58.3	57.9	60.1
Fixed electric uses ¹	12.7	16.2	20.8
Fuels (transportation use) ²	26.6	27.9	30.6
Total final uses	97.6	102.0	111.5
Total demand	146.9	165.0	185.0

¹ 860 Kcal per kilowatt-hour

² Excluding bunkering, but including fuels for agriculture and industry.

53. The reference objectives for the evolution of total energy demand equaling 146.9 million tons of oil equivalent in 1980 are set at 165.0 million tons of oil equivalent in 1985 and 185.0 in 1990. An elasticity of energy consumption with regard to the gross domestic product equal to 0.7 is subject to these objectives. The situation of Italy's energy dependence on oil is, moreover, such that actions for its reduction, primarily saving and replacement of oil with coal and nuclear energy, are still necessary and urgent even if demand should increase at rates lower than the ones indicated and, absurdly, even if demand should be stabilized at present values or be reduced. This requirement releases considerably the principal actions to be carried out from the quantitative estimates of future demand for energy and confirms in any case the full validity of the actions themselves.

54. The figures indicated above are the result of the objectives broken down for the three sectors in which demand for energy consumption is organized: thermal energy, electrical energy for fixed uses, fuels.

55. A reference objective of 60.1 million tons of oil equivalent in 1990, compared with 58.3 million tons of oil equivalent in 1980 has been adopted for energy intended for thermal uses. The almost stable state of consumption, compared with a 3-percent increase in the previous decade, reflects the expected success of the actions of energy saving and replacement in the civil sector (residential and services) for uses of energy in the form of heat predominantly at low temperature, in the industrial sector for uses of heat at high and medium temperature and in the agricultural sector for use of heat at low temperature.

56. For electrical energy, the reference objective of consumption is 68.7 million tons of oil equivalent in 1990 compared with 42.2 in 1980, involving an average annual increase of 5 percent similar to the historic rate of the past decade. In this area, opportunities for saving are affected objectively. The assumed growth rate disregards factors of exogenous origin concerning the energy system, like an increase in the country's degree of industrialization, the process of industrial conversion to electronics, development of consumption patterns connected with a further development of the South.

57. With regard to fuel, the average annual increase in demand stemming from the objective adopted (30.6 million tons of oil equivalent in 1990 compared with 28.6 in 1980) is 1.5 percent. In the previous decade, the average annual growth rate was 8 percent. The more restrained dynamics assumed as objective also reflects the effect of technological innovations that reduce the consumption of fuel per unit of travel.

58. In view of the demand objectives indicated above, the plan anticipates, during the present decade, a sizable evolution of the distribution of energy supply by sources.

59. A comparison between the reference objectives for 1990 and the 1980 situation reveals, for each source, the following variations in the contribution with regard to total supply, including supply intended for meeting demand for nonenergy consumption:

A. Participation by coal in the overall supply increases from 8.5 percent in 1980 (12.4 million tons of oil equivalent) to 18.4 in 1990 (34 million tons of oil equivalent).

B. The participation of nuclear energy shows a 0.3-percent increase in 1980 (0.5 million tons of oil equivalent) to 4.3 in 1990 (8 million tons of oil equivalent). Both for coal and especially for nuclear energy, a subsequent contribution of the percentage quota will occur in the years following 1990 as the result of investment activities started in the time span of the plan.

C. Natural gas will see its share increase from 15.5 percent in 1980 (23 million tons of oil equivalent) to 18.9 percent in 1990 (35 million tons of oil equivalent).

D. New renewable sources, not present in 1980, will represent 1.1 percent of the total supply in 1990 (2 million tons of oil equivalent).

E. The other sources alternative to oil for electric energy production--hydraulic and geothermal--will drop from 7.6 percent in 1980 to 6.3 percent in 1990, with their contribution in absolute value remaining almost unchanged (10.9 million tons of oil equivalent in 1980, 11.6 in 1990).

F. The contribution of oil drops from 67.2 percent in 1980 to 51 percent in 1990. This reduction reflects the residual role assigned to oil. In spite of that, it continues to be by far the largest source.

Its weight in absolute value undergoes a decrease in 1990 (94.4 million tons of oil equivalent) compared with 1980 (98.8 million tons of oil equivalent), reaching a maximum around 1985 (105.4 million tons of oil equivalent) in connection with the commencement of operation of the production plants already ordered that use fuel oil.

It is obvious that any result in terms of replacement of the oil source and of overall reduction of energy consumption that can be achieved with the policies indicated in the plan will give rise to a subsequent reduction in the contribution of oil with regard to the above-indicated figures. This bestows on oil, in fact, the role of a residual source.

60. The evolution of the composition of energy supply as described above results from an effort at reasonable balance made on the basis of a verification of the conditions and times of feasibility and taking into account the experience of other countries. Previous formulations of the National Energy Plan were characterized by the assumption of strongly unilateral objectives, like the objective of a sizable development of nuclear energy. The more balanced and realistic consideration reflected in the quantitative reference objectives by source taken by the present plan indicates a line capable of being followed. But precisely because of this, even in the flexibility of the plan, detours along the way based on an indefinite and improbable search for optimum abstract solutions are to be avoided. On the contrary, the effort should be concentrated on the moment of implementation, once the path to follow has been recognized as reasonable.

61. The tendency to modify the composition of the spread of sources proves to be, from the above-indicated objectives, significantly important. Nevertheless, our situation in 1990 will still differ considerably from the situation that the other leading industrial countries will attain. In that year, Italy's dependence on oil will still be comparatively high. Compared with 51 percent in Italy, it will be 50 percent in Japan, 43 percent in the FRG, 42 percent in the United Kingdom, 40 percent in the United States, 28 percent in France. The gap between

Italy and the other countries will also be sizable with regard to the contribution of nuclear energy and total consumption in 1990: 5 percent in Italy, 7.6 in the United Kingdom, 9.2 in the United States, 11.6 in Japan, 30 percent in France. The contribution of nuclear sources to electrical energy production in 1990 will be 14 percent in Italy, 50 percent in Belgium, 75 percent in France, 36 percent in Germany, 20 percent in Great Britain.

Electricity Production per Source in the Years 1980, 1985, 1990¹
(millions of tons of oil equivalent)

	<u>1980</u>	<u>1985</u>	<u>1990</u>
Imports	1.3	--	--
Hydro-geo electricity	10.9	10.5 ²	11.6 ²
Nuclear electricity	0.5	2.0	8.0
Thermal electricity			
Methane	2.4	2.5	2.9
Solid fuels	4.1	6.7	22.4
Oil products	23.0	31.4	23.8
Total	42.2	53.1	68.7

¹ Conversion of a kilowatt-hour on the basis of 2,200 Kcal per kilowatt-hour.

² In an average hydrological year and from natural contributions.

62. These differences will have a repercussion on the national average cost of energy, especially of electricity, and, therefore, on our industrial system's ability to compete.

63. With regard to electricity, unit costs (lire per kilowatt-hour) estimates of the more important sources--oil, coal and nuclear--that contribute annually in Italy 73 percent to the total supply of electricity, vary widely with regard to the calculation pattern and to the reference assumptions adopted. Economic evaluations made by foreign electricity agencies, like EDF [French Electric Company] in France and CEGB [Central Electricity Generating Board] in Great Britain and by ENEL, show a definitely greater degree of economy of nucleoelectric production in comparison with electricity produced by coal and fuel oil. The cost component pertaining to capital amortization is higher in the case of nuclear energy. Nevertheless, the investments are tied almost exclusively to engineering, manufacturing and construction activities performed in Italy by at least 80 percent. They represent employment opportunities, stimuli for economic activity, enhancement of the nation's labor force, in a top-level sector with fallout also on international markets. The import cost component, that is to say the one tied to fuel, has, on the other hand, littleweight for nuclear energy in comparison with coal and fuel oil. The worsening of the balance of trade is almost insignificant.

64. Extensive areas of uncertainty in evaluating comparative costs stem from the evolution of the prices of energy sources. It must be borne in mind that the relative gap between oil and coal prices with equal energy content tends to decrease in the future. That may produce in the future the attractiveness pertaining to the two sources, because the cost of fuel is what determines the advantage of coal in the total cost structure of a kilowatt-hour. Nevertheless, it can be believed that, in the next decade, the price of coal will make it possible to maintain,

reasonably that, in the next decade, the price of coal will make it possible to maintain, although decreasingly, an appreciable advantage of the unit cost of a kilowatt-hour from coal in comparison with the cost from oil. The gap between a kilowatt-hour produced by burning coal or oil and a kilowatt-hour produced by burning uranium should become more pronounced.

65. On the basis of the present price structure, also including sophisticated processes of desulfuration and of smoke abatement for coal, the EDF estimates that the cost of a kilowatt-hour is 25 lire for the nuclear source, 50 lire for coal and 70 lire burning fuel oil.

66. In the above-indicated situation, any effort directed toward increasing the even limited contribution of national resources seems to be necessary. In spite of considerable resources allocated to exploration for hydrocarbons on our territory and offshore, it does not appear to be destined to increase to an appreciable degree. At any rate, it is necessary to intensify research activity, which can give rise to an increase of the national contribution, although in the long term.

67. On the basis of data available at present, an increased contribution of 0.9 million tons of oil equivalent must be taken into account for oil, in comparison with 1.6 million tons of oil equivalent in 1980. The rate of increase is, therefore, lower than the total supply. The national contribution of coal is limited to the Sulcis mines with an extremely low percentage ratio, 2.8 percent of the total for coal. National natural gas does not seem to have prospects for much expansion. In a long-term strategy, there should be a trend toward a gradual reduction of its extraction, in order to assign it a role as strategic reserve.

Actions

68. The actions to be carried out in the decade of the 1980's, in order to implement the plan's strategy, for attainment of its quantitative reference objectives, will be indicated analytically in the following paragraphs. The actions are arranged schematically by primary energy sources. The actions in which the same demand policy is expressed, with a view to conservation and rational use of energy, are also with reference to a source, in this case "possible" and not "real." In other words, energy saving is regarded, possibly, as a source whose use brings a specific contribution to a solution of the country's energy problem.

69. Among the energy uses of particular sources, prominence is given to the production of electricity, which is a sector still subject to expansion, owing to requirements of development and territorial rebalancing. The degree of penetration of electrical energy with regard to the consumption of fuels (hydrocarbons, coal) increased in Italy from 1973 to 1980. This trend will still go on, because the country's civil development is linked to energy forms, like electricity, provided both with high quality and easy distribution possibilities.

70. From this point of view, actions to be carried out with regard to rural electrification take on importance. At the end of 1979, inhabitants in places without electricity service were limited, respectively [sic], to 317,000 with seasonal residence. On the total exhaustion of funds already appropriated, the two [sic] figures will be reduced to 240,000 and 300,000. The present plan provides for

completion of rural electrification and further actions in underelectrified rural areas with a program in which recourse to renewable sources will be especially favored. The pertinent financial commitment is estimated at 540 billion 1981 lire.

71. The programs for modernizing the electricity transmission and distribution network take on equal importance. The voltage of the distribution network depends on the power of the powerplants, on the size of transfers to load junctions, on reliability and reserve requirements. Ever since its first programs, ENEL has chosen for continental Italy development of a transmission and intertie network with a voltage of 380 kilovolts. This program is also confirmed for the medium term. In a not too distant future, it will be necessary to go over, in continental Italy, to a higher voltage level, already specified as 1,000 kilovolts. In Sicily and Sardinia, the level of 220 kilovolts seems to be adequate for the powers admitted by the powerplants and the distances over which transmission takes place.

72. The primary distribution networks are developed at voltages of 132-150 kilovolts. This level seems to be appropriate also for the long term. To summarize, the forecast of ENEL investments in the 1981-1983 period in the transmission and distribution sector is estimated at around 3.5 trillion [lire].

73. The effort required for improvement of Italy's electrical system is concentrated, however, primarily on production. In the following paragraphs and in the appendices an analytical account will be given of the programs for making the contribution of electrical energy adequate during the span of the decade.

74. In view, however, of greater emphasis on actions in the electricity sector, the actions described below analytically take into account the generality of the forms of use in comparison with the overall situation of the primary sources.

Saving

75. Energy saving, regarded in the light of a possible source of supply, may represent, in 1990, the largest new contribution to Italy's energy balance. The actions that will be indicated have as their general objective of reference a reduction of consumption between 15 and 20 million tons of oil equivalent a year. This reduction [is] disregarded in the total consumption goals (165 and 185 million tons of oil equivalent) forecast respectively for 1985 and 1990. The actual final results and, therefore, the level that will be reached by the total energy consumption in 1985 and 1990 will depend besides on the active saving policies on the trend of the underlying variables, like growth of the gross domestic product, the evolution of oil prices, the reaction to variations in the prices in terms of consumption behavior by enterprise operators and family operators.

76. Attainment of the saving objectives entails a large number of actions, practically in every field of civil and economic activity. Support and incentive measures capable of rationalizing and accelerating the processes of adjustment to the new conditions caused by the energy crisis are more closely tied to national energy planning.

77. The incentive policies discussed here are the specific ones, like the ones approved in Bill number 2382, voted by the Senate and now being discussed in the Chamber, whose appropriations must be regarded as a first installment of the much

larger appropriations scheduled in the present plan. But other incentives are also found in the more general legislation on industrial policy, like Law 675 (the energy aspect is taken up in the finalized sector programs) and like the recent bill providing a fund for technological innovation and further measures for applied research. The close connection between the rational use of energy and the general industrial policy objectives occurs in response to two points: the individual system is supported by increasing its ability to compete and a mass of direct investments equalling three to five times the size of the incentive granted is activated.

78. Specific actions are scheduled for each participating sector. The following four directives are common to various sectors: incentives for changing processes, measures for efficiency control, dissemination of information, price policy.

79. With regard to inventives, they should pertain, in general, to research, innovation, demonstration projects, investments, technology transfer. Coordination of public action on the central, regional and local level takes on special importance.

80. With regard to efficiency control, rules should be devised to ensure minimum energy efficiency and to facilitate the introduction of devices making it possible to save energy. These actions will also have the effect, in not a few cases, of improving access by Italian products to foreign markets.

81. Concerning information, the following should be attended to: development of energy consultation and diagnosis services, training of energy experts, publication and distribution of illustrative material on the various methods applicable for achieving saving, establishment of data banks on energy conservation and on their applications, revision of the nation's energy accounting system, in order to obtain a better definition of the saving potentiality and, therefore, a better coordination and effectiveness of actions. Participation by local agencies, energy agencies and by other ministries in actions to be coordinated or promoted, or both, by the Ministry of Industry.

82. With regard to price policy, an important saving incentive effect will result from a guideline based on the criterion of "long-term replacement costs." More specifically, it will be necessary to operate with varying gradualness.

Revision of the prices of fuels, especially of the relative price of methane and diesel oil as replacements that often display a wide price spread although offering similar performances.

Revision of the price of cogenerated electricity, that is to say of the price paid by ENEL to the "cogenerator," in order to take into account the kilowatt-hour cost in the new plants.

Extension of a multihour system of electricity rates.

83. Now the specific actions are discussed, with their pertinent financial dimension, for the large action sectors: industry, civil residential sector, agriculture, transportation, cogeneration and remote heating.

84. Industry absorbs about 44 percent of the final consumption of energy. In recent years, the growth rate proved to be very restrained: an average annual rate of 1.3 percent, compared with a much more rapid growth of the total consumption of electricity (3.93 percent). However, with the substantial saving already achieved in the sectors with greatest energy intensity (chemical, iron and steel, cement), the application of conservation methods will make possible an average specific consumption reduction of about 10 percent in the industrial sector. That will lead to an annual saving in the industrial sector of 6 million tons of oil equivalent in 1990, indicated for guidance. The main actions to be undertaken pertain to attainment of production processes, adoption of technological innovations, development of demonstration projects, wise management of the use of energy.

85. The total government financing figure needed for carrying out the actions scheduled amounts to about 2.4 trillion lire per the period 1981-1990. Most of it, 2.3 trillion, will go to investment incentive directed toward energy conservation in the industrial sectors in the form of contributions in capital account or loans at a favorable rate. Also included is financing for demonstration projects. Public incentive may induce a total investment of about 9 billion lire, which should be sufficient to attain the above-mentioned saving objective by the end of the decade.

86. The civil sector absorbs 30 percent of the final consumption of energy. The rate of increase of consumption has been much greater in the household sector than in the services sector, although there has been a slowdown of this trend in recent years. The plans actions provide for a rationalization of the use of energy by means of an improvement in the technical features of building and the performance of heating plants, optimization of the use of electric household appliances, limitation of the use of heating plants, dissemination of information to improve users' habits. In addition, recourse to cogeneration plants and use of renewable sources will be encouraged. Application of these actions will lead to an annual saving of about 3.4 million tons of oil equivalent.

87. Actions in the civil and residential sector require legislative and regulatory intervention, in order to remove barriers and to stabilize standards. In particular, adequate mechanisms are needed to subdivide costs (investments, maintenance) and benefits (reduced expenditures for energy) equally between owners and tenants. Government financing for the proposed actions is at 1.98 trillion lire for the period 1981-1990, in addition to which account is taken of the trillions for incentive of low-temperature applications provided for the "solar energy" sector (discussed in paragraph 167, below). The largest share pertains to incentives for improving existing buildings, with an objective of a 20-percent penetration of interventions by 1990. For new buildings, effective energy conservation action will entail improvements in the provisions of Law 373, although other instruments may be needed in case of more stringent requirements than the ones programed so far.

88. The agricultural sector absorbs about 2 percent of the final consumption of energy. Average energy consumption of the sector remains low owing to the still modest technological development of a large part of the farms. Progress in this direction will, therefore, involve an increase in the direct demand for energy. The need also arises in this sector for reducing dependence on oil by the adoption of saving methods and the use of renewable sources. The saving objective adopted for the agricultural sector is 0.4 million tons of oil equivalent in 1990. Better

maintenance of tractors and machinery and a more rational utilization of fertilizers will be especially encouraged. Allocations scheduled for carrying out the proposed actions in the agricultural sector amount to about 100 billion lire for the period 1981-1990.

89. The transportation sector absorbs about 24 percent of the final consumption of energy. It is characterized by use of motor vehicles and by an average annual consumption for motor vehicles lower than the European averages. The demand for passenger transportation, public and private, is, therefore, destined to increase at relatively high rates, especially in extraurban traffic. Freight transportation will also have a marked expansion resulting the process of industrialization of the South and from decentralization of industrial locations. This traffic will still continue for a long time to concentrated on highway transportation, because of the time and size of the financial commitment needed for a massive development of alternative systems of transportation.

90. The reductions in consumption that can be achieved by 1990 will come from the achievement of a transportation system, from reduction in the specific consumption of the individual means, from an improvement in the driving and maintenance manners of motor vehicles, from diversification of fuels. In addition, regulations must be introduced on the following: control of the energy consumption of all vehicles, appropriate rules for traffic in urban centers, uniformity of components in accordance with energy saving criteria, provisions pertaining to engine emissions and exhaust. Incentives are scheduled for development of prototypes and components of transportation means with low energy consumption and their initial industrialization, improvement of the energy efficiency of all means of transportation, development of recycling of means of transportation out of use. Finally, a series of actions will be planned for improving infrastructures in cities, for the freight transportation system, for air transportation. The saving objective in the transportation sector is estimated at 4 million tons of oil equivalent in 1990. Government financing for carrying out the proposed actions amounts to about 3 trillion lire for the period 1981-1990.

91. In the industrial sector, combined production has had, in Italy, a considerable development, even in comparison with the development of other industrialized countries. In 1979, self-production of electricity in combination reached 87 percent of industrial thermoelectric self-production, equal to 17 percent of the nation's thermoelectric production. In the civil sector, aside from the cases of Brescia and Reggio Emilia, there still are no examples of significant achievements. There is, however, a widespread interest by regional and local administrations causing a consistent future development of these systems to be anticipated. In view of the long achievement times and the economic return, development of combined production is tied to accurate analyses of economic coexistence and the availability of adequate financing. The objective of massive saving attainable amounts to 3.8 million tons of oil equivalent in 1990. Public incentives for carrying out the proposed actions amount to about 500 billion lire for the period 1981-1990. Additional financial resources of community origin will be possible.

Coal

92. The objectives for 1985 previously indicated for coal give the actions to be carried out the nature of an ambitious, binding program. In absolute terms, coal is assigned the major role in the process of diversification of the sources of energy anticipated for the decade.

93. The present annual consumption of coal amounting to 18 million metric tons (equal to 12.4 million tons of oil equivalent) will increase, by way of guidance, to 26 million in 1985 (17.7 million tons of oil equivalent) and to 50 million in 1990 (34 million tons of oil equivalent). The objectives estimated for the middle and end of the decade are tied to an assumption of sustained development, especially for the use of steam coal (by ENEL powerplants, for industrial uses, for civil uses and for coal-oil).

94. The greatest progress to be made is in the field of steam coal. ENEL will have to accomplish the following, in addition to the present coal-fired powerplants with power amounting to 4.79 gigawatts electric:

Convert powerplants burning fuel oil at present to coal, for 3.7 gigawatts electric. Build new powerplants for about 17 gigawatts electric in time to put most of them in commercial operation by 1990.

The number of new establishments depends on the number of standard units of installed power in each one, also with regard to optimization of the costs of energy distribution. It is necessary to decide in 1981 on the location of coal-fired powerplants for a total of 6 gigawatts electric.

95. The increase in coal consumption in the industrial and civil sector is caused predominantly by conversion of existing plants. The objective raises no important technical problems--some sectors have already operated and are completing thorough changes, like the cement industry, for example--but it depends on the incentive system that will be adopted or on autonomous decisions by the administrations with regard to public buildings like hospitals and schools.

96. The major problems to be solved for achievement of the program concern supply, construction of receiving and distribution infrastructures, location of new plants, environmental control, development of new technologies on the use of coal, utilization of the Sulcis resources. By far the greatest effort, because of the logistic complexity required by the use of coal, lies in the sector of infrastructures: a huge financial outlay and, still more, a huge organizational effort.

97. Italy's coal requirements by 1990 are relatively modest, in comparison with world production (3.5 billion tons of coal equivalent in 1979) and with world resources (650 billion tons of coal equivalent). The probably sharp increase in world consumption requires a precise supply strategy with two basic objectives: reliability and price. That is to say that it is indispensable to aim at the following:

At long-term purchase contracts with the best qualified producers and sellers.

At engagement in research and direct production and also by means of possible shareholding participation.

At maximum diversification of the geopolitical supply areas.

Coordination between supply from commercial activity and from mining activity must be stabilized.

98. Achievement of a logistics system of infrastructures suitable for the amounts of coal to be moved, regardless of actions that must be carried out in the countries of origin and that give rise to no smaller problems, involves the following:

Availability of new ships for transportation.

Construction of maritime terminals for servicing ENEL powerplants and other civil and industrial uses.

Establishment of coastal storage areas and development of unloading and moving capacity of small-sized ports.

Suitability of internal transportation structures: waterways, railways and highways.

99. In order to minimize the negative effects stemming from an excessive dependency on the international charter market, Italy will have to increase its own number of large-sized ships for ocean transportation. In order to satisfy the anticipated coal supply, it will be necessary to have--in addition to the present fleets-- 20 more ships with 50,000 to 80,000 tons gross tonnage by 1985 and 40 more ships with 80,000 to 120,000 tons gross tonnage by 1990.

100. In accordance with a widespread rule of world shipping, one-third of the transportation will be accomplished in owned ships, while the rest is covered with medium- and short-term charters in equal shares. In addition, the availability of smaller ships must be provided for distributing coal to users on the coast and along inland waterways, especially along the Po. The program for making the fleet suitable for the new transportation requirements also is an important opportunity for the nation's shipbuilding industry, which can thus benefit from a considerable amount of orders.

101. Solutions alternative to sea transportation might be found in special circumstances, like coal that can be transported, for example, from Poland by means of a coal pipeline. Technical feasibility studies have been completed. Economic checking remains to be performed. This kind of infrastructure, in any case, can be competitive with regard to conventional transportation systems.

102. At least two large coal terminals are needed in Italy for receiving coal. Also, on the basis of the experience of other countries, they represent the most suitable structures for the supply of huge amounts of coal with large-capacity ocean-going ships. Each terminal will include several unloading points equipped, at the same time, for transshipment to lighters, ships and carriers for distribution by land. The terminals will be for the purpose of handling the requirements of ENEL and of other industrial and civil users and will be located on the upper

Adriatic and in the center-south along the Tyrrhenian coast. The Vado-Savona receiving port will support both terminals. It is capable of supplying the central Ligurian coast and of contributing to the needs of the Piedmont and Lombardy regions.

103. In addition to the terminals, construction of new coal-fired powerplants by ENEL is scheduled, within the framework of the construction program, with appropriate port structures for the needs of the individual plants close to which they will be located. Construction of coastal storage areas is also scheduled. They will be supplied by medium- and small-tonnage ships and will serve for distribution to smaller users.

104. For supplying users located on the Padua Plain, the most interesting solution provides for the use of the course of the Po and of the associated canals. Development of the Padua waterway systems is, moreover, a project with a broader scope, capable of meeting a large number of the area's requirements with considerable positive effects on the entire national transportation system.

105. On the basis of the locations of the leading consumption centers, it will be necessary to improve some rail sections and to acquire specialized cars for transporting coal. In addition, a supply of containers must be provided for motor vehicles for supplying by highway small users at a short distance from the marshaling yards.

106. The choices of functioning and location of the infrastructures are summarized in appendix C. These choices are obviously consistent with the guidelines on the location of coal-fired powerplants summarized in appendix A.

107. A strong endeavor must be devoted to the problems of an environmental nature, tied to the various phases of the coal movement and use cycle. Modern technologies make plants and procedures available that make it possible to contain the effect of coal on the environment within limits definitely below the values prescribed by law. The greater costs resulting from this will be no obstacle to the priority obligation of making the sharp increase in the use of coal compatible with the requirements of protecting health and of respecting the environment.

108. No less attention must be devoted to the problems of coal-fired energy establishments in terms of effects on the territory. Full involvement of regional and local authorities will be a determining factor in their solution. That is the condition for the removal of obstacles to locations, taking into account the fact that coal-fired powerplants have experienced at times considerable difficulties, even with a simpler authorization procedure than for nuclear powerplants.

109. Research work is underway in many countries for the development of new technologies or the improvement of existing ones, for the purpose of expanding the coal penetration sectors. The efforts are being directed primarily toward increasing the output and flexibility of coal combustion. Thus, it will be possible to extend the types of coal that can be used in boilers and decrease negative environmental effects. The most interesting technologies pertain to the use of coal-oil mixtures, combustion with a fluid bed, production of synthetic fuels.

110. Mixtures of pulverized coal in fuel oil (coal-oil) are particularly attractive owing to the possibility of accelerating, in our country, replacement of oil with coal in the present oil-burning boilers. On the basis of studies and demonstration programs in progress, an objective of coal consumption in this way has been taken on amounting to 0.2 to 0.5 and 0.5 to 1 million metric tons a year, respectively, for 1985 and 1980 [sic; should read 1990].

111. Combustion in fluid bed offers special advantages, because it makes it possible to burn low-quality types of coal and to reduce emission of pollutants by means of retention of the sulfurous anhydride in the boiler and less formation of nitrogen oxides. In Italy, production of a 15-kilowatt [15-megawatt ?] electric fluid bed boiler in an ENEL powerplant in Sardinia.

112. Much attention is being paid to development of the technology for producing gaseous and liquid fuels from coal. The advantages result from the fact that products are obtained that are less polluting and have a wider range of uses than coal as such. Support and updating of demonstration projects for gasification of coal with low and medium heating power incorporated with thermoelectric powerplants using combined gas-steam cycle and for coal liquefaction should be found in the framework of the present plan. For this last-mentioned technology, Italian industry must not lose the opportunity of being incorporated in international programs. The possibilities of producing and using synthesis gas with medium and high heating power and methanol are also to be followed attentively.

113. In addition to deposits of lignite, being mined at present by ENEL, and some marginal resources of scant industrial interest, Italy's only option in the field of solid fossil fuels lies in the Sulcis Basin. Owing to its importance to the energy sector, the mining development project of that region must be supported and adequately encouraged. Its exploitation began recently. Economically recoverable reserves amounting to 57 million metric tons have been identified in the northern part of the deposit. Mining work is scheduled to start in 1981. At full rate, it will result in a production estimated at 2.8 million metric tons of washed coal a year. This degree of production can be doubled, if exploration of the southern part should produce favorable results.

114. Sulcis coal is a poor-quality coal with a high ash and sulfur content. These characteristics make its combustion in large amounts unlikely without desulfuration. Therefore, a project is now being prepared that, in case of positive results, will lead to the achievement of a production complex for synthetic fuels that will be able to absorb 2.8 million metric tons of washed coal a year in the initial phase. Other projects of an experimental nature are under study, like fluid-bed combustion, that might contribute to giving a positive solution to the problems of utilization of this national energy resource.

Nuclear Energy

115. The objectives assigned by the plan to the development of nuclear energy provide, for 1985, a 1.2-percent (2.0 million tons of oil equivalent) participation in the total supply of energy. For 1990, a 4.3-percent (8.0 million tons of oil equivalent) participation. These goals entail occurrence of the following events during this decade:

Full operation of the Caorso powerplant (850 megawatts electric) (see appendix 4 [sic; should read D]).

Completion of placing in operation of the two 1,000-megawatt electric Montalto di Castro units.

Construction and placing in operation of four more units with 1,000 megawatts electric each.

Acquisition of Italy's share (400 megawatts electric) of the electricity produced by the Superphenix (1,200 megawatts electric) breeder reactor powerplant, built in France within the framework of collaboration between France, Germany and Italy.

116. A period of about 9 years elapses between the location and placing in operation of a nuclear powerplant. The contribution of nuclear energy is destined to increase subsequently up to the end of the century. Therefore, actions pertaining to the construction of additional units that are to go into operation successively by 1990 must be started as soon as possible.

117. Crucial points for achievement of the program are: availability of technologies at a level consistent with the program's objectives and dimension, management of the fuel cycle from supply to disposal of the wastes, location of the plants. The existence of an effective, clear safety systems is a horizontal requirement and, in a special way, a determining factor, for each of the above-indicated points.

118. With regard to technologies, it is necessary to start from the fact that light-water thermal reactors are an affirmed industrial reality, with a high degree of economy and reliability.

In fact, 175 units are in operation with a total power of almost 117 gigawatts electric, an annual production of about 600 billion kilowatt-hours and a cumulative production of about 3.3 trillion kilowatt-hours.

119. Because of its tested collaboration relationships with the major world enterprises, Italian industry is capable of achieving the scheduled nuclear program.

120. The CNEN will carry out demonstration and industrial promotion programs, in accordance with what is specified in the 5-year Plan, in order to support the nation's industry in the process of active management of licenses; in order facilitate coordination of the development and experimentation activities performed in Italy with similar activities in other countries; in order to enable the nation's industry to have better conditions of competitiveness also on foreign markets. Completion of the 40-megawatt electric Cirene prototype thermal reactor takes on special importance in this framework. It will enable the nation's industry to be better qualified as a potential supplier of entire nuclear systems on the international level.

121. Achievement of the nuclear program and respect for the dates for the plants to go into operation require an accurate programming the various phases of construction of the new powerplants. The conclusions reached with regard to standardization of the plants, development of a unified program, coordination between the parties participating in the complex construction activity are set forth in appendix B.

122. Breeder reactors are in an advanced phase of the research and development cycle. They require, however, a considerable demonstration and learning effort, so that the possibility of their effective placing in the industrial production of electricity can be verified. Breeder reactors raise a technological challenge to which a knowledgeable and mature response must be given. What is involved is utilization of the energy potential of the uranium source in a much greater degree, by a factor of 50 to 60 times.

123. In Italy, a decision concerning the industrial use of breeder reactors is not of the present moment. First of all, it is necessary to have achieved and administered, for a suitable number of years, a sizable conventional nuclear program, in order to have the raw material--plutonium--required for making up the first fuel loads. It is also necessary to have acquired full mastery of the safety factor. It is, however, important to keep open, in this sector, the option of the presence of the nation's industry that is not subordinate in the context of a system of international cooperation. The following actions pertain to:

Maintenance of systematic, componental participation by industry and ENEL in construction of the Superphenix-1 powerplant.

Participation by the nation's industry in preparation of the reference project of Superphenix-2.

Construction of the PEC [Fuel Element Testing] reactor by CNEN as a research and development instrument on fuel for breeder reactors, for experimentation on the safety aspects, for development of the capabilities of the nation's industry. CNEN has recently expressed itself positively on this subject.

124. Italy's nuclear program is encountering no particular obstacle with regard to supply of the required raw material.

125. Verified uranium resources in the world with reasonable extraction costs amount to around 2.6 million metric tons, the equivalent of about 32 billion tons of oil equivalent, if these same resources are used in thermal reactors, and the equivalent of over 1.6 trillion tons of oil equivalent, if they are used in breeder reactors. Distribution of the deposits is rather widespread geographically. Therefore, coverage of the world's uranium requirements for supplying nuclear powerplants does not form an uncertainty factor.

126. At any rate, Italy has already been ensured of the availability of natural uranium in sufficient amounts to cover its needs up to 1995. In addition to existing foreign supply contracts (13,000 metric tons), it is possible to count on the use of detected national resources (1,500 metric tons) and on other resources that will emerge from ENI's mining exploration now in progress and on the reuse of reprocessed irradiated fuel.

127. Also with regard to enrichment services, availabilities for our country cover requirements up to 1995 and beyond. In fact, in addition to Italy's participation in EURODIF [European Diffusion Agency] (16.25 percent), there are contracts in existence with the United States and the USSR.

128. Access to availability of enrichment services results from the gap between the originally scheduled size in connection with a large Italian nuclear program and the very modest achievements. This involves the tying up of orders amounting to several trillion lire. In view of the "strategic stock" nature of this availability, public financial intervention seems to be necessary for covering the financial burdens generated. On the other hand, actions are in progress for decreasing those tieups. A reduction of Italy's participation in EURODIF (from 25 percent to 16.25 percent) has already been implemented. In addition, an attempt is being made to put part of the available enriched uranium on the market, although the prospects do not appear to be favorable, at least in the short term.

129. There is also an excess national production capacity for the fuel manufacturing phase by thermal reactors. This is because of the already mentioned delays in implementing the nuclear program. The plant of the Nuclear Fabrications Company (a subsidiary of AGIP [National Italian Oil Company] Nuclear) has been activated only up to half its capacity: 200 metric tons of fuel for BWR [Boiling Water Reactor] reactors. In 6 years of operation, it has run with an average utilization factor of about 25 percent. In the future, based on the requirements of powerplants scheduled to be in operation by 1990, the present plant, whose saturation is foreseeable, will be adequate for assembling fuel elements for pressurized water reactors (PWR).

130. With regard to breeder reactors, construction is scheduled, in Italy, of units for producing (2 to 4 metric tons a year) of mixed oxides fuel intended for supplying the Superphenix reactor within the framework of Italy's participation in this project and for supplying the PEC reactor.

131. With regard to the fuel cycle after use in the reactor, operation of the powerplants provided for by the plan entails solution of problems concerning the following:

Irradiated fuel to be reprocessed.

Low-activity wastes and various kinds of component material irradiated and to be conditioned.

High-activity radioactive wastes to be conditioned and, after surface storage (30 to 50 years), to be placed in permanent storage areas.

132. While awaiting reprocessing, irradiated fuel unloaded from powerplants will be stored in special collection pools, possibly in a centralized place. Then a reprocessing plant must be provided. The plan for national nucleoelectric powerplants has, up to the middle of the 1990's, too limited dimensions to justify installation of a this kind of plant. Meanwhile, reprocessing will be performed in existing plants abroad. At any rate, the following has been provided: execution of the preliminary project for a reprocessing plant on an industrial scale; use of CNEN's EUREX [Enriched Uranium Extraction] plant for pilot reprocessing runs of fuel coming from thermal reactor and use of CNEN's Itrec pilot plant to complete acquisition of knowledge on the reprocessing technology.

133. For low-activity wastes, the problem of temporary storage after conditioning comes up in the short term. Complete activation of the plants of the Nucleo

Company is scheduled for this purpose for conditioning and definitive systematization of radioactive residues with low and medium activity coming from nuclear powerplants in operation.

134. With regard to high-activity radioactive wastes, the problem will come up after 1990 for small amounts, pertaining to fuel reprocessed abroad; at the beginning of the next century, for wastes that will be produced in Italy in the planned reprocessing plant. While, on the one hand, the pilot plants for conditioning the high-activity residues that will be admitted to the EUREX and Itrec plants are already in the planning and inactive experimentation phase, on the other hand research is continuing to locate the geological formation most suitable for final storage of the high-activity radioactive wastes.

135. Location of the plants has been, up to now, the critical point of Italy's nucleoelectric programs.

136. Together with a more mature knowledge of the energy issue, a new readiness to receive nuclear establishments is now emerging. The part played by the regions is contributing in a determining way to this positive development. The most recent phase has seen the coinvolvement and participation of feasibility factors, starting with the site problem, of the nuclear program. Closer relations between regions and local agencies on the one hand, the government and energy agencies on the other hand has made it possible to bring to light the relation between energy and development, in its various territorial dimensions. Regional energy plans are being prepared within the national development plans. Agreements have been stipulated between regions and national energy agencies. Others are in process of being made. Conditions of consensus for the nuclear option are maturing in this framework.

137. At present, some regions are ready to play host to nuclear plants. Now it is necessary to tackle with these regions the problems of location of specific sites. For that purpose, joint region-ENEL-CNEN committees will have to activate, as has already been done partially, for probing of a technical nature in the soils included on the map of sites and surveys of a socioeconomic nature on the chosen areas. The situation of the options for nuclear establishments is presented in appendix A.

At any rate, the effectiveness and clarity of the response to problems of safety, of the environment and of the territory, to which a separate chapter in this plan is devoted, will be critically important. Also with regard to sites for mining of uranium resources on national territory, the pertinent problems will be solved in the framework of sure guarantees after exhaustive research on safety and ecology.

138. Fusion processes are looming up on the horizon of energy potentialities of nuclear origin. Development of technologies for producing nuclear fusion require considerably long time and sizable investments. The first significant construction of plants for experimentation of the system is scheduled toward the end of the century. Demonstration plants for production of energy may be available in one or more subsequent decades.

139. CNEN's 1980-1984 5-year plan provides for development, within the scope of community collaboration, of Tokamak-type magnetic confinement machines. It also provides, in the inertial confinement fusion sector, for maintenance of a level of activity that will make participation in possible international initiatives feasible.

Natural Gas

140. Natural gas contributed 14.5 percent to covering the nation's energy requirements in 1980. The 1990 objective is to increase that contribution to 18.5 percent. In absolute value, compared with a present consumption of 28 billion cubic meters, the corresponding levels for 1985 and 1990 will be, respectively, approximately 35 and 43 to 45 billion cubic meters.

141. The major problems in carrying out this program are use of national resources, supply from abroad, infrastructures, programmed control of the development of consumption in various sector and reliability.

142. The maximum effort will continue to be made in a search for new resources on national territory. For this purpose, it is necessary to adjust regulations to favor the implementation of exploratory plants by public and private industry and to enable operators to set up funds with reduced taxes for the purpose of reestablishing reserves depleted by consumption. Prospects are not favorable for new sizable findings in Italy. That suggests assigning to existing deposits an increasing role of modulation of annual availability and of the strategic reserve, setting as an objective for the national contribution to be reduced from 13 billion cubic meters (1980) to 7-8 billion in 1985. Greater recourse to national reserves may, however, become necessary in connection with difficulties in the supply of gas from abroad, for technical reasons, market crisis or interruption of supply contracts. This kind of plan is based on a coordinated management of all the nation's resources, including stocks in storage, on development of these resources and also on larger production plants in preparation of new deposits to be used exclusively for supply.

143. Supply from abroad (15 billion cubic meters in 1979), already large, is destined to more than double by 1990. So large an increase may occur, if, in the future, a reasonable competitiveness of gas with the alternative fuels is maintained and it proves, at any rate, to be compatible with the size of the reserves existing in the supply areas. These areas are located by Italy's geographic position and by the links consisting of the kind of economically valid transportation infrastructures (methane pipeline or facilities for transporting liquefied natural gas). These geographic areas indicate the following as leading suppliers: north African countries, western African countries and the Middle East, countries with a socialist economy and north European countries.

144. In the light of existing conflicts and of requirements for geographic diversification and supply reliability, the following is the distribution of supplies from abroad, in 1985, in billions of cubic meters: Libya, 2-3; Holland, 6; Soviet Union, 7; Algeria, 12; for a total of 27 to 28 billion cubic meters.

145. Coverage of requirements by 1990 also has the possibility of being ensured. Distribution of supply by that time naturally presents greater uncertainty factors.

The increase in requirements, compared with 1985, amounting to about 7-10 billion cubic meters, can be obtained with the contributions of some of the present supplying countries, like Algeria, Lybia and the Soviet Union, or from countries not yet active suppliers, like Norway, Nigeria and still others. The choice has not only commercial aspects, but also political-strategic aspects. In fact, it is necessary to maintain a large number of supply channels for the purpose of reducing vulnerability, which, in the case of natural gas, is especially high for each individual relationship. Moreover, the maximum amount imported from each individual country must be limited in such a way that a possible failure can be handled, for at least 6 months, with national reserves and structures prearranged for that contingency. The possibility of operating in coordination on the European level, especially with regard to supply from the Soviet Union and from North Africa, takes on considerable importance in this situation. A subsequent integration of the European network of methane pipelines may represent a safety factor in this connection.

146. The main infrastructures provided by the plans for acquiring, receiving and distributin natural gas are:

Completion of the Algeria-Italy gas pipeline and its incorporation into the existing national and international network.

Construction of structures on land for transportation and primary distribution of Algerian gas to large users.

Improvement of the existing receiving and regasification terminal and possible construction of new GNL (liquefied natural gas) terminals that would become necessary in case of new GNL imports in addition to the ones scheduled from Nigeria.

Construction of urban distribution networks in the South.

Development of methane pipeline networks on national territory.

Development of storage systems both for purposes of modulation and of establishment of strategic reserves.

147. An attempt is in progress by some producing countries that have found support in OPEC headquarters to bring about a price increase, supporting parity of the calorie cost of gas with the calorie cost of crude oil computed FOB the producing country. Implementation of that kind of point of view, which does not take into account the diversity of user markets or of the greater costs of transporting and distributing gas, would redimension the capability of gas for penetrating the energy market. The lack of flexibility and the size of gas supply contracts in terms of amount of energy and of economic-financial commitment make it necessary to continue a search for better protection by means of the encouragement of coordinated action with other consumer countries in the framework of the European Community, for which Italy may function as a vehicle for African gas, and by means of the crystallization of a ~~consistent~~ community policy with great contractual force and uniformity in the sphere of common interests.

148. With regard to natural gas intended for producing electricity, provision has been made for the construction of turbogas plants with a power of about 800

megawatts electric, under construction or authorized, and some others already planned with a power of 950 megawatts electric. Thus, the power of this kind of plant, to be used to meet peak demand for electricity, will amount to about 2,700 megawatts electric. These powerplants can use diesel oil or gas as alternatives.

149. The methanization of the South, being implemented in the framework of the specific program, takes on special importance. Availability of sizable amounts of natural gas will motivate the location of industries and the changeover to methane by existing ones and may satisfy the energy needs of 3 million families already around the middle of the 1980's.

150. Development of natural gas consumption, in accordance with the indicated guidelines, might turn out, subsequently, to be changed, if it is placed in an anomalous situation of domestic prices incapable of reflecting the cost of substitution of the supply of gas or of alternative sources of energy.

The criteria for determining the prices of gas for the various final uses must be consistent with the guidelines of the plan with regard to energy saving, replaceability or priority of use.

Hydroelectric and Geothermal Energy

151. Hydroelectric energy contributes about 7 percent to covering the nation's energy needs, with a production of about 45 billion kilowatt-hours, equal to almost 25 percent of the total electricity produced. The 1990 objective is to increase this production to 50 billion kilowatt-hours. This entails accomplishment of the following by 1990:

Construction and placing in operation of a large number of the plants that ENEL has singled out as technically possible.

Reactivation of small ENEL electric powerplants currently not used.

Modernization, development and coordination of existing plants, and also construction of more small hydroelectric powerplants by municipalized establishments, self-producers, private companies and various ENEL agencies.

152. The ENEL program for exploitation of the country's residual water resources for energy purposes has come up with the possibility of constructing 73 new powerplants, by means of well-founded analyses. They could yield a natural production of about 7.5 billion kilowatt-hours. Their implementation, within the framework of a rational, multiple use of water, is tied to overcoming difficulties varying in nature and especially local opposition. In the past, for economic reasons, a certain number of small hydroelectric powerplants were inactivated. Under the new conditions of energy economy, six have been reactivated for a total contribution of about 17 million kilowatt-hours. Reactivation of five more has been started for a further contribution of about 14 million kilowatt-hours. Reactivation of 45 more powerplants, with an average total production capacity of about 82 million kilowatt-hours, is proceeding. This restoration will take place gradually over the years until 1984.

153. In order to promote utilization of small waterfalls, also in a situation of the promiscuous use of water, the following is provided in Decree-Law 2382: liberalization of plants up to 3,000 kilowatts that can be built and operated by private companies and agencies other than ENEL, granting of financial contributions for construction, development or reactivation of powerplants. This additional contribution has also been taken into account in drawing up the 1990 objective.

154. Geothermal energy contributes about 0.4 percent to covering the nation's energy needs. The predominant part of this contribution comes from utilization of the Tuscan basins for the production of electricity: 440 megawatts electric with the production of 2.5 billion kilowatt-hours a year, equal to about 1.6 percent of the nation's electricity production.

The 1990 objective is to bring the total contribution of geothermal energy up to 0.6 percent of the nation's energy requirements. This entails the following:

Construction and placing in operation of new geothermalelectric power plants for an additional 1.5 billion kilowatt-hours a year.

Formulation and implementation of measures for the utilization of geothermal energy in nonelectrical uses, up to a value equal to 0.3 million tons of oil equivalent a year.

155. Present estimates indicate, for the geothermal reserves suitable for producing electricity, that is to say for the flows that can be extracted at temperatures above 130°C, a power value of 1,000 megawatts electric (including the 440 megawatts electric already exploited). In view of the objective set for 1990 (increase of 200 megawatts), the uncertainties on the nature of the flows in the basins and environmental links must be taken into account. Moreover, the technical time needed for developing the projects, from obtainment of the mining permit to the first production of electricity, is not short. This time is on the order of 7-8 years in the case of so-called steam systems and may extend to or exceed 8 to 10 years in the case of hot water systems.

156. Geothermal reserves with a low enthalpy (that is to say pertaining to fluids extractable at temperatures below 130°C) are large. Their utilization makes it possible to supply heat directly to industrial, civil, agricultural and zootechnical sectors. Utilization of these resources depends not only on the availability of geothermal springs, but also on factors of usability in place, in view of the difficulties in transferring the heat over long distances. The advisability of utilization is, therefore, evaluated case by case, also with reference to other sources of heat available locally (cogeneration, thermal wastes, thermal solar source). Nevertheless, based on verified potentiality (several million tons of oil equivalent) and with reference to possible users, the objective of constructing powerplants, in the decade, for the utilization of geothermal fluids with a saving capability of 0.3 million tons of oil equivalent seems reasonable.

157. With regard to utilization of dry hot rocks, it is difficult to predict the energy contribution that may be obtained from this. Studies have only started and there are many problems to be solved, like promotion of hydrothermal systems and methods of utilization.

158. Development of geothermal energy in Italy requires new legislation directed toward facilitating the obtaining of authorizations for operations and toward specifying the role of local agencies with regard to geothermal fluid uses. Moreover, geothermal energy is regarded as being among the renewable sources for purposes of financing intended for encouraging application in the civil residential, industrial and agricultural sector.

Solar

159. The contribution of solar energy to the energy supply turns out to be about 1 million tons of oil equivalent, at present, by means of using firewood included in the energy balance among solid fuels. The 1990 objective is to increase the total contribution of solar energy, in a wide variety of forms, to at least 2 million tons of oil equivalent.

160. Utilization of solar energy can take place directly by obtaining thermal or electrical energy from solar radiations, and indirectly (wind energy, thermal falls, biomass). The various technologies appear today in ways quite differentiated by degree of industrial maturity, by opportunity levels (utilization sectors, forms of energy produced, amount of potential contribution), by links with dissemination, by economic advisability.

161. Solar technologies are still in a highly evolutive phase. Therefore, there is a requirement for sizable investments in research, more than proportional to the contribution that this source will make to covering the nation's energy needs in 1990.

The National Energy Research Plan, for the 1981-1985 5-year period, provides for expenditures amounting to 265 billion lire. The National Energy Plan, in addition to taking over the research objectives formulated in the PNRE [National Energy Research Plan], proposes to maximize the contribution of those technologies offering prospects of economic validity, by means of encouraging demand of users and industrial promotion. Therefore, priority is assigned to solar energy for thermal uses, to photovoltaic conversion, to wind energy and to applications pertaining to biomasses.

162. The plan aims at a rapid expansion of solar energy for low-temperature thermal uses, especially for the production of sanitary hot water and for use in public and residential buildings and in tourist and sports facilities, with the resultant installation of about 1 million water heaters by 1990. In order to attain this objective, actions will be implemented for encouraging demand and for supporting development of the innovation.

The following are provided for in particular: both incentives in favor of users and promotional activities by ENEL and ENI (consultation, financial advances, and so on), advertising activities and dissemination of information by regions, establishment of a quality control service concerning systems and components, research and development for the production of panels with higher characteristics, suitable for air conditioning applications, actions for the specialized training of installers and reliability of service and maintenance.

The scheduled initiatives include installation of collectors by means of granting incentives and preparation of demonstration programs coordinated between ENI, ENEL, CNEN and industry.

163. The uses of solar energy for obtaining fluids at medium temperature are valuable, but the technologies required are more complicated and expensive (concentration distribution systems). The cost of the energy produced is especially high. The guideline is to maintain a presence in the sector with technological development initiatives and especially initiatives of industrial promotion, in order to reduce costs of production of the system and of its components and to improve efficiency and operational reliability by means of the use of demonstration plants.

164. Production of electricity thermodynamically (systems with towers and field mirrors and system with distributed collectors) is based on well-known and tested technologies. In this sector, Italy boasts of initiatives with absolute international value. High production costs and the relatively modest margins for reducing them, however, cause limited room for development to be anticipated for this technology. Photovoltaic conversion offers more interesting prospects. A strict technological development strategy aligned with development in other industrial countries is needed. The technology of silicon and plants with "flat" collectors with modular size, able to be connected to the electrical network, will be developed on a priority basis. Experimental plants will also be produced and the opportunities disclosed by the international market, especially by the energy countries, will be cultivated.

165. Wind energy presents interesting indicative prospects internationally. Italy's interest is more limited, owing to the scarcity of areas with strong, constant winds. There is, however, room for a coordination experimentation and demonstration program in the field of large mechanical devices with a size greater than 1 megawatt and development of medium- and small-sized machines.

166. In the field the the utilization of biomass for energy, that is to say organic matter of vegetable or animal origin (coming primarily from agricultural compost and not used for food purposes or as raw material for industry), we are aiming primarily a developing those technological applications already mature for applications on a large scale. Some biomasses lend themselves to conversion into biogas by means of anaerobic digestion. This process makes it possible to activate a gas with a high percentage of methane and a residual with excellent fertilization qualities. Therefore, the process also makes possible optimum disposal of organic sewage liquids. Another form of utilization of solar energy is production of alcohols for chemical uses or as substitutes for gasoline in motor vehicles, on the basis of agricultural products and biomass. Incentives are provided for in all these areas for the use and development of adequate demonstration programs.

It is necessary to develop the structures of CIP [Interministerial Price Committee] and to extend the supervision system to diesel oil. In view of greater certainty for operators, the state will be able to impose stricter rules with regard to supply plans binding for companies and the holding of supplies.

For purposes of ensuring routine management of oil emergency situations resulting from possible unforeseen supply crises, the country should provide itself with an emergency plan for overcoming in an orderly way the serious problems that might arise. Management of the emergency is prearranged in time both with regard to the agencies and the instruments used both legislative and administrative.

Oil

168. There can be no misunderstandings on the need for a binding, innovative oil strategy, although the actions concerning oil have, in the plan, a different sign from the actions designed for the other sources whose contribution we aim at increasing and motivating. Reliability and low cost of supplies and rationalization of uses raise complex challenges requiring a sizable effort by the government and operators.

169. The quantitative reference objectives already indicated, with a reduction of the contribution in the decade from 67 percent to 51 percent and maintenance of consumption by 1990 around the same levels as at present (around 100 million metric tons), leave a role of primary importance for oil. For a long time, oil will still be one of the crucial factors in the country's economy. The actions provided for by the plan, therefore, are strongly binding by nature. They cannot be lessened by the role of closing source assigned strategically to oil.

170. The basic problems concerning reliability of oil supplies are located more in the international sphere than in the national sphere. Export policies of the producing countries, raw material prices, discovery and availability of new resources, political and international crises, unforeseen techniques are only some of the factors acting on an international scale that can cause very strong repercussions in the supply system. Therefore, what is needed is Italian action conducted by state agencies and by public and private operators, according to their respective roles, in order to carry out pertinent actions in the sphere of IEA, EEC and toward OPEC and other international levels, also for the purpose of developing cooperation and common programming strategies of demand and supply with the producing countries.

171. Pursuit of conditions of better economy for oil supplies is basically important to the nation's balance of payments.

172. The following is required for an effective supply strategy capable of ensuring continuity and regularity of flow and of minimizing foreign exchange outlay:

Expansion of research and production activity abroad by means of maximum diversification of geological and geopolitical operating areas.

Diversification of the number of crude oil suppliers. At the same time, a broader and more flexible commercial maneuver will be encouraged internationally that will be capable of handling situational fluctuations and that take into account OPEC policies tending to promote the process of exporting products rather than crude oil.

Search for understandings with producing countries and with their agencies for the achievement of flexible agreements based on the following:

a. On an exchange of raw materials for services, plants, goods with a high technological content, also outside the oil cycle.

b. On actions or participation by Italian industry in local refineries or other activities in the oil cycle.

c. On actions by agencies of the producing countries in the national oil industry for the utilization, possibly in the form of association, of refineries or distribution systems or other sectors.

173. The following are also necessary for purposes of better diversification and flexibility of the supply system:

Evaluation of feasibility and economy and, in a positive case, achieve agreements for long-term supply of LPG [Liquefied Petroleum Gas], and, consequently, the receiving, storage and distribution structure for this product.

Evaluation of the economy of supplies and, in a positive case, achieve agreements for the supply of methane to be used as a complete or alternative fuel on the national market, also with appropriate support actions.

174. New, strong encouragement must be given to oil exploration in Italy.

Geological evaluations concerning the future contribution of domestically extracted crude oil indicate small values for the requirements; a few million metric tons a year. Even in the limited amounts, oil obtainable in Italy has an obvious strategic value. Innovative topics will be pursued from a geological point of view, operational point of view (deep seas, deep drilling) and technological point of view (heavy oils, bituminous schists, advanced recovery).

It will be necessary to adjust current regulations, in order to promote the establishment and implementation of organic, systematic exploration programs and to enable operations to restore reserves.

175. The structures and production capacities of Italy's oil industry will have to be modified, in order to cope with the development of national demand for oil products, opportunities for exports, forecasts of penetration of new foreign products on the Italian and the international markets, the quality of available oil. The following will be especially necessary:

For the refining system:

Making, within the framework of coordinated decisions, of investments for the secondary conversion plants needed for optimizing output toward lighter products, directly from crude oil or by means of reprocessing heavy fractions.

Rationalization of the system, limiting the primary conversion plants and favoring elimination or reconversion of obsolete production capacities.

Adjustments for processing heavy crudes.

For the storage system:

Increase of capacity and flexibility conditions and rationality, developing them in such a way as to handle conditions of operational emergency and of strategic reliability and to meet requirements for an economical system.

For the distribution and logistics system:

Revise the system by means of incentives needed for investments directed toward rationalization of logistic facilities (oil pipelines) and of the network. The objective desired is an increase in the average output per plant, in order to come up to European standards.

176. It is a basic requirement of reliability and operational effectiveness for a number of operators, especially those who have direct access to oil, to remain on the Italian market. It is also in the national interest to admit new supply enterprises directly or indirectly connected with producing countries and the stability of interventions on the market is especially important, preventing withdrawals or insertions motivated exclusively by speculative objectives.

177. Adequate conditions of reliability of oil supplies from abroad cannot be achieved, if the real cost of the supply of raw materials needed by the country is not equitably recognized by the domestic market. The oil price policy should, on the one hand, make a situation of certainty possible for operators present on the market and, on the other hand, with regard to supply plans by the companies.

Safety, Environment, Territory

178. The political decision to guarantee man's safety, protection of the environmental values, uniform development of the territory are inseparable from the energy plan. This decision will not be subordinate either to economic cost calculations nor will it be instrumental in obtaining consensus. It is in accordance with the obligation ratified by the Constitution, especially article 32.

179. Danger, which is structurally tied to every human activity, presents varying intensity and quality in the energy sector, along a scale that ranges from the values peculiar to the traditional industrial activity to the high values connected with nuclear activity. The danger can, however, be controlled. Methods for controlling the danger are known together with the very technologies involving acute degrees of danger and they have brought about, also thanks to the experience accumulated over the years, progressively wider safety margins. Development and full utilization of these techniques are part of the energy program. In particular, with regard to nuclear energy, the CNEN is responsible for developing simultaneously industrial promotion, research and activity of safety.

180. The technology of thermal reactors (using light water and other types) has reached high degrees of reliability from the point of view of safety. The storehouse of knowledge and experience has continued to be enriched in the span of 20 years, during which the cumulative production of electricity by nuclear energy has exceeded 3.5 trillion kilowatt-hours, equal to 20 times Italy's total present production of electricity. This storehouse is available in our country and can further be fed by the constant flow of research and experiments performed and by the operation of plants. The decision to take on a unified project for the package of power-plants provided for by the plan will contribute to a refinement of safety methods.

181. Activity in the sector of safety includes actions of a regulatory and operational nature and in the sector of information.

182. In the field of regulations, Law 185 of 1964 on "safety of plants and protection of the health of workers and the public against the dangers of ionizing radiations resulting from the peaceful use of nuclear energy" will be updated. Account will be taken of the experience obtained during its application, of the internationally established standards, of the recent EURATOM directive concerning radioactive protection, of the evolution of competencies resulting from the health reform.

183. A new discipline will be established with regard to the safety control agency, by means of the establishment of an agency provided with full independence to which the resources operating within the scope of the Safety and Protection Directorate (DISP) of CNEN will be transferred. The competencies of the new agency will be coordinated with the agencies operating under the national health service.

184. Reorganization will be proceeded with for the purpose of a more efficient administration of safety, of the competencies in the hydrographic, hydrogeological, meteorological, seismic and ecosystems analysis sectors, which are fragmented and scattered at present.

185. In the field of operations, encouragement will be given to the research and development effort by CNEN on topics pertaining to safety. CNEN's 5-year plan schedules investments amounting to 250 billion lire in the sector of private reactors. Knowledge resulting from the activities conducted by the EEC on safety and financed by specific community investments will be acquired.

186. Attention will be paid to updating action plans in case of emergency, whose discipline was defined recently. Local health facilities will be prearranged and activated and coordination will be organized between the agencies concerned with handling emergencies, with periodic operational checks.

187. In the field of information, it is necessary to bear in mind that with regard to safety objective measures and actions are not sufficient, but rather they have to be accompanied by a subjective awareness of the safety conditions by the collectivity. Therefore, it is indispensable to make data and documentation on various aspects of safety accessible to the public. Moreover, safety cannot be regarded as guaranteed by the mere issuing of laws and technical regulations. It is the expression of a maturity and a culture that sees the involvement, each one in his own role, of all those who, by legislating, approving, planning, exercising or controlling, are called upon to bear witness to the level of safety with which the dangerous activities are planned, built and operated. With regard to nuclear powerplants, information centers in which the public will have the possibility of becoming directly familiar with data pertaining to safety but that must be a place selected for civil dialogue and discussion of opinions will be essential instruments.

188. The obligation of ensuring man's safety is supplemented with the use of protection of environmental values. Problems of the effect on the environment of the use of various energy sources are particularly important in our country owing to the high population density, to the concentration of production activities and of urban installations on the plains and along the coasts.

189. The situation with regard to regulations, standards and technical control structures in the field of the effect of energy activity on the environment requires a process of updating, rationalization and completion. Account must be taken of provisions of a community nature. The EEC has approved a directive concerning the sulfurous anhydride levels of particles suspended in the atmosphere. In addition, another directive providing for "environmental impact evaluations" (VIA) for any industrial project of a certain size is in process of being approved. This second directive prescribes the preparation of specific reports to be submitted to the control authorities and for consultation by the inhabitants of the areas concerned. Therefore, it will also be applicable to large energy production plants. Actions will be carried out regarding the various energy sources: extension of environmental monitoring activities, intensification of studies and experiments on the disposal of residual heat from thermoelectric powerplants, for the purpose of checking on the compatibility of new plants with the aquatic ecosystems and on the reliability of methods of direct discharge into the atmosphere (wet towers, dry systems and mixed-type systems), encouragement of activities for using residual heat in the field of agrothermy and aquaculture, construction of remote-heating networks and promotion of systems of cogeneration of electrical-heat energy.

190. In addition to the aspects concerning protection of the environment, problems arise with regard to the relationships of large energy establishments and the territory.

191. Establishment in a given area including large electricity generating plants gives rise to factors of concentration and polarization that affect the equilibrium of the territorial situation. The plan's strategy provides for rebalancing actions based on the concept of complete development of territories with the presence of many energy facilities. It is a question of making other production activities grow, together with the construction of powerplants, of especially developing agriculture, of improving the territory ecologically, of providing it with more extensive services.

192. Plans for integrated development of territories with large energy establishments will be the responsibility of the regions and the local authorities with appropriations handled by the state budget. After consultation with the regions, amendments to Bill Number 2383 have been prepared for the purpose of providing contributions on capital account in accordance with location decisions and current annual contributions during the operating period of the powerplants. Thus, incentive mechanisms will be created that, far from being a kind of risk indemnity, will open up great possibilities for development and management of the territory.

193. The going into force of the recent law number 309 enables ENEL to promote the establishment of companies or consortia with public and local agencies. It will therefore become possible to establish a company, already budgeted, with participation by ENEL, CNEN and the regions (SITI [Integrated Intensive Territorial Development] company) for the purpose of making an operational engineering instrument of the territory available to the regions and local collectivities. Although the decision-making power of regional and local authorities remains unaffected, the SITI company will facilitate the entrepreneurial initiatives of the state's financial course in the above-indicated manners. That will be able to connect its own action with the action of similar initiatives existing on the regional level.

Resources

194. Implementation of the plan entails a sizable use of resources, in view of which an improvement in the general situation of our economy, especially with regard to its development, will be brought about with a definitely positive effect.

195. Table 4 contains estimates of the total financial resources to be used during the decade in accordance with the guidelines and to achieve the plan's objectives. In 1980 lire, it is a question of over 88 trillion, including the appropriations provided by the National Energy Research Plan (PNRE). The following will contribute to the formation of the required financial funds: the state's budget, the budget of the national energy agencies, EEC financing. The amount for investments indicated above includes a little less than 10 trillion lire for investments abroad by ENI in the oil and natural gas sectors (tables 2C and 2D). The pertinent financing will take place also with special transactions, like foreign to foreign transactions, depending on the specific characteristics of those activities.

196. The state will be directly responsible for the sums intended for incentives for solar energy, saving and rational use of energy (2.98 trillion lire in the 1981-1983 3-year period; 9.38 trillion in the entire decade) to which should be added the more than 2.7 trillion lire for research. The state Treasury will also intervene, indirectly, in supporting the expenditure for investments of the energy agencies. This will be by means of contributions to the endowment funds of ENEL and ENI and financing to CNEN.

197. The largest part, by far, of the resources needed by ENEL and ENI for investments in the energy sector will be derived from their respective budgets, that is to say from the proceeds from electricity sales, from oil products and from natural gas.

These proceeds are tied to system of regulated prices and rates: administered and supervised prices with regard to oil products and natural gas placed on the domestic market by companies in the ENI group, rates for electricity produced by ENEL.

198. Need for an energy price policy that will transfer to the consumers price increases occurring at the origin has constantly been stated in international centers. Also in the case of Italy, with the exception of some arrangement of a social nature and other for limited production sectors marked by exceptional situations, this policy has no alternatives. If it should be decided to follow a different line, price increases not passed on to the consumers would end by burdening public finances, aggravating them with a intolerable additional load to the burdens resulting indirectly from repercussions of oil price increases.

199. Implementation of the energy program has among its assumptions a return to normality of ENEL's economic and financial situation. ENEL's indebtedness has increased to about 18 trillion lire, including 5 trillion in foreign debts. The delay that occurred in adjusting the thermal surcharge, that is to say on the rate component tied to variations in the cost of fuel oil, has caused a huge credit toward the Adjustment Fund. The normal component of the rate is again under tension with regard to the costs of electricity production. The relief derived from

an allocation of 1.35 trillion lire by the Treasury, forming the 1981 share of state contributions to the ENEL endowment fund, will be short lasting. ENEL's viability as a large customer of Italy's industrial system is in jeopardy. It is pointed out that ENEL's investments cover 13.5 percent of all of Italy's industrial investments and 50 percent of the investments of public agencies and of companies with state participation.

General Summary of Investments and Incentives Provided for by the PEN
(billions of 1980 lire)

	<u>Investments</u>	<u>1981-83</u>	<u>1984-90</u>	<u>1981-90</u>	<u>1981-80</u>
Coal		1,580	11,220	12,800	412
Nuclear energy		2,410	10,480	12,890	613
Gas		2,180	4,800	6,980	121
Oil		7,845	16,900	24,745	121
Hydro		1,200	3,900	5,100	8
Geothermal		300	700	1,000	60
Electricity transmission and distribution		4,000	8,500	12,500	167
<u>Incentives</u>					
Solar*		330	1,070	1,400	265
Civil saving		540	1,440	1,980	250
Industrial saving		740	1,660	2,400	400
Agricultural saving		50	50	100	15
Transportation saving		1,080	1,920	3,000	410
Cogeneration and remote heating		150	350	500	
Total		22,405	62,990	85,325	2,721

Other saving activities (hydrogen, storage, use of the territory, biotechnics, models, environmental protections)

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*Including 1 trillion lire of incentives for low-temperature applications in civil uses.

200. EEC financing takes on importance for the development of our energy program. Up to now, it has been possible to have access to the new community instrument (NIC [expansion unknown]) with the application of a discount on interest. It is necessary for the EEC to provide for renewal of the NIC and for an adequate endowment of financial resources. Initiatives, like remote heating, that have already benefited from community aid, will be able to attain more ambitious goals, if EEC's outlay for energy takes on the dignity of a true community structural policy.

201. Human, organizational, managerial, administrative resources fall, in the broad sense, within the framework of the resources needed for implementing the plan.

202. The insufficiencies and bottlenecks of public administration are a critical point. Public administration, which is called upon for tasks of great responsibility and penetrating actions of control, promotion and coordination, can count

today on the rather limited resources of General Directorate of Energy Sources under the Ministry of Industry. The present plan does not propose to tackle the complex problems of a general reform of public administration. It is a question, in a special way, of enabling the General Directorate of Energy Sources to cope with the large number of constitutional adjustments tied to implementation of the plan, covering with its structures sectors like the sector of renewable sources that have no coverage at present except by an expedient.

203. With regard to the high-level coordination needed for implementation of the plan, the formula of the Standing Technical Committee for Energy, headed by the Minister of Industry and consisting of the presidents of the national energy agencies, the director general of Energy Sources and a limited number of experts, still seems to be adequate.

204. Implementation of the plan various aspects: the institutional aspect, the aspect of legislative initiative and the aspect of coordination of the energy policy lines of the public agencies operating in the sector. These aspects, many of which were pointed out during this summary presentation, are presented analytically in the basic document, paragraph 5.7, "Institutional Aspects and Legislative and Administrative Instruments."

The financial allocations required for carrying out the plan will be systematized in a permanent legislative structure, leaving it up to the money bill to provide, year after year, the necessary instruments depending on the logic followed with approval of the 1981-1983 3-year budget.

205. The new plan, which started to be formulated in the spring of 1980, has already devoted ample space to the discussion and verification phase. It is necessary to go, without further delay, to the operation and implementation phase, proceeding with strict continuity. After all, time is the plan's critical resource.

Appendix A

Options for Installing Coal-fired and Nuclear Thermoelectric Powerplants

1. During the recent consultations that took place with the regions, concerning large energy installations, the requirement emerged for the government to submit possible locations for coal-fired and nuclear powerplants. This requirement is to be related to the fact that many regions are about to make their decisions in the framework of regional development plans or, in any case, of specific regional energy plans.

2. Possible locations are indicated in the present appendix, region by region. The following observations must be made clearly:

a. The proposed locations have the nature of options, that is to say of proposals for the decisions that must be made by the regions. As options, they do not have a constructive nature. The regions can tend toward different sites, provided they meet the necessary characteristics and are, at any rate, included on the map of the sites with regard to nuclear powerplants.

b. The decisions do not all have to be made in the immediate future. There is only the restriction of the time limit of the plan, requiring the choice of some sites by the end of 1981.

c. The total power of the powerplants for the proposed locations exceeds the power of the powerplants scheduled to be placed in commercial operation by 1990. The size of the proposals refers in part to the energy supply to be attained in the first years of the 1990's. It has been decided to formulate extensive proposals, both because of the long time interval running between decisions on the sites and activation of the powerplants, and for immediately providing the regions with data for their own long-range planning.

3. Choice of locations proposed for the new coal-fired and nuclear powerplants must be in accordance with two orders of criteria:

The first one concerns the characteristics of the site, which must be suitable for the requirements of installation of a large energy plant; geophysical characteristics of the soil, seismicity, environmental and socioeconomic situation, availability of cooling water, infrastructures for fuel supply.

The second one concerns the functioning of the electric system, which, owing to requirements of service continuity and containment of transportation losses, requires the imbalances between production and demand for electricity in each geographic area to be as limited as possible.

4. The following indications on the type and power of the plants have emerged from the preliminary investigations on the areas capable of having coal-fired powerplant installation and from the results of the "map of sites" prepared by CNEN for the nuclear powerplants. Except for indication on the contrary, standard 640-megawatt units, each, will be installed in the coal-fired powerplants and standard units of about 1,000 megawatts each in the nuclear powerplants.

Piedmont

a. Coal-fired thermoelectric powerplant with two 300-megawatt units at Chivasso (Turin).

b. Nuclear powerplant with two standard units in one of two areas already specified along the course of the Po.

Lombardy

a. Coal-fired thermoelectric powerplant with two standard units at Bastida Pancarana (Pavia) and further units, also coal-fired, with a combined production of about a total of 600 megawatts, including one 300-megawatt unit at Tavazzano and another one to be located in connection with the remote-heating programs.

b. Nuclear powerplant with two standard units in a place to be determined in one of the two areas already specified in southeastern Lombardy.

Veneto

- a. Coal-fired powerplant with two standard units in a site along the coastal strip.
- b. Nuclear powerplant with two standard units in a site to be determined in one of the two areas already specified in southeastern Veneto.

Friuli-Venezia Giulia

- a. Coal-fired powerplant with two standard units along the coastal strip.

Emilia Romagna

- a. Coal-fired powerplant with two standard units at Ravenna and a third one, also coal-fired, with a combined production of 640 megawatts, to be located also in connection with the remote heating programs.

Toscany

- a. Coal-fired powerplant with four standard units, to be located along the Leghorn and Grosseto coast.
- b. Nuclear powerplant with two standard units on the Island of Pianosa.

Umbria

Coal-fired powerplant with two standard units to be located in southwestern Umbria, or a nuclear powerplant with one standard unit also in southwestern Umbria.

Abruzzo

Coal-fired powerplant with four standard units, including two at first at Vasto (Chieti).

Campania

Nuclear powerplant with one standard unit along the last stretch of the Garigliano River.

Puglia

- a. Coal-fired powerplant with four standard units to be located at Brindisi or Taranto.
- b. Nuclear powerplant with two standard units in one of the areas already specified in Salento.

Basilicata

Nuclear powerplant with a standard unit along the Ionian coast.

Calabria

Coal-fired powerplant with four standard units at Gioia Tauro (Reggio Calabria).

Sicily

- a. Coal-fired powerplant with three units (expandable to four units), each with a power of 300 megawatts, along the southwestern coast.
- b. Nuclear powerplant with one standard unit in one of the two areas already specified in Ragusano.

Sardinia

One or two coal-fired powerplants, with a total of four 300-megawatt units.

5. It should be pointed out, in connection with the construction priority of the plants, with regard to authorization and construction times, that the coal-fired powerplant program makes it possible, if it is started immediately, to handle the serious shortage of electricity forecast in the second half of the 1980's and, at the same time, to proceed with a gradual replacement of oil with coal for thermo-electric protection [sic; should read production]. Therefore, within 1981, coal-fired powerplants with a total of 6,000 megawatts must be located definitely.

6. Nuclear powerplants take a longer time for authorization of the sites and construction. In order for them to be able to contribute, at the end of the 1980's, to covering requirements and to replace oil, it is also necessary, in accordance with the cadences specified in appendix B, for the areas to be specified within 1981, in accordance with Law 393 of 2 August 1975, for at least 6,000 megawatts, that is to say for three powerplants each capable of housing two standard units. In order to specify the large geographic areas in which these first powerplant are going to be located, reference has been made to the size of the shortage of electricity that will occur in each area at the time when those powerplants go in operation. In view of the contributions of the new coal-fired powerplants and of their geographic distribution, it seems necessary to locate, within 1981, four standard nuclear units in two sites in northern Italy and the two remaining units in southern Italy.

Appendix B

Coordinated Program for the Construction of Nuclear Powerplants

1. The plan provides for four 1,000-megawatt units to go into operation in 1990, in addition to the Caorso powerplant and to the one under construction at Montalto di Castro (two 1,000-megawatt units each). In view of the average construction time of the powerplants, it also provides that action will be started pertaining to the construction of further units intended for going into operation after 1990.

2. In connection with those provisions, ENEL (prime contractor and general architect), CNEN (responsible for industrial production and control authorization), the construction industries (suppliers of systems and components) and AGIP Nuclear

(fuel supplier) have agreed, at the urging of the government, upon a program of coordinated actions for the installation of nuclear powerplants. This program ranges from authorization of sites to placing the powerplants in commercial operation.

3. In view of an increased standardization of the plants to be built, the program provides for the development of a single project (unified project), in order to obtain the necessary backing by the control authorities. Adoption of a unified project, that is to say identical for the whole package of the next 7 or 8 new units (with the exception of those few adjustments that may be required in connection with individual sites), makes possible substantial reductions in completion times, owing to the following:

Early authorization procedure and not to be repeated for each plant as a whole.

Rational basis for the activities of manufacturing the main components, identical for the various plants.

Prior organization of the construction activities to be used on several sites with possible integration of the individual programs.

Other advantages can be obtained in the starting and testing phase of each unit, with progressive utilization of the results and experience derived from the first units built in accordance with the plan. Optimizations made possible in personnel training and in management of the powerplants, including handling of spare parts, are not to be neglected.

4. In that kind of logic, standardization implies the determination and freezing of the characteristics of all the machinery connected with the entire "package" and, naturally, choice of a single reactor type. The seven to eight 1,000-megawatt units in the package will be equipped with the same kind of reactors. This choice is to be attributed to the more extensive connections that this reactor makes possible with the European situation, with reference both to an expansion of the potential market for Italian industry and to uniformity of the whole regulatory system characterizing all nuclear powerplants.

5. The program reported in the enclosure was determined on the basis of these premises. It provides the following significant dates:

	<u>End of Authorization of Site</u>	<u>End of Work on the First 1,000-megawatt Unit</u>
First site	31 December 1982	31 December 1988
Second site	31 October 1983	31 October 1989
Third site	31 August 1984	31 August 1990
Fourth site	30 June 1985	30 June 1991

The second unit of each site will be completed with a phase difference of 1 year from the first, in order to optimize use of the facilities in the construction yard.

6. A priority requirement is availability of the sites. Therefore, the regions concerned have to come around promptly to designating the areas in which the specific sites are to be located. In the meantime, steps pertaining to the process of authorizing the sites themselves are to be speeded up. The Ministry of Industry will be responsible for action needed to reduce to the minimum the time for granting ENEL access authorizations to the sites, in order to make the surveys needed for qualifying them. For the purpose of avoiding the possibility of further checks appearing only at the completion of the qualification studies conducted by ENEL, the Control Authority will follow the qualification processes from the very start. In turn, the Ministry of Industry will implement adequate action with regard to the other ministries concerned in the technical investigation, in order to ensure their contribution at the time of designation of the areas by the regions.

7. In view of the need for regulating in the best possible way the relations between ENEL and local agencies in the territory in which the powerplants are to be located, the Ministry of Industry will promote definition of a typical agreement between the electrical agency and local agencies, especially with regard to the most proper utilization of the contributions provided by the laws, for the purpose of the complete development of the territory and for appropriate information on the aspects of safety of the residents and of protection of the environment. Finally, account must be taken of the possibility--within the scope of a revision of DPR [Decree of the President of the Republic] 185, necessary moreover for adjusting the rules to the guidelines adopted by the EEC--of eliminating the first phase specified by article 2 (the "Map of the Sites") and to reestablish the single procedure of the former Item VII (split at present as a result of Law 393) on location by the regions and on the ministerial "no objection" to construction of the plants.

8. An appropriate project structure, using the planning capabilities of ENEL and of the plant-engineering companies in the Ansaldo Group (IRI-FINMECCANICA [Industrial Reconstruction Institute-Mechanical Engineering Finance Corporation]. Guidance, coordination and supervision of all the activities are provided by an ad hoc group, under the ENEL Construction Department, which reports to a management committee in which industry also participates.

9. In order to develop the planning effort fully, it will be necessary to arrive at a more extensive coinvolvement also of suppliers of the principal systems. Adequate ways of purchasing are to be used for preplanning or advance supplies.

10. CNEN will also participate in the project, in that framework, in order to determine sufficiently early opportunities for promotion and support of the nation's industry.

11. In order to ensure maximum effectiveness for development of the Unified Project, it is essential for the Control Authority to follow its preparation, for the purpose of giving the necessary backing progressively as various phases are completed, independently of the availability of sites. In this connection, the Ministry of Industry will have to give the Control Authority a precise mandate. Therefore, the date for updating the rules to be adopted (general criteria, specific rules like technical guidelines, rules for panning mechanical and electrical systems and components), is set with reference to the present international situation. The

backing of the Control Authority will find expression in the issuance of ad hoc technical guidelines that will include the choices made during development of the Unified Project.

12. Freezing of the safety and health protection criteria will immediately follow conclusion of the safety analysis integrated at the plant level to be carried out together with preparation of the Unified Project. The above-mentioned set of criteria and rules must remain valid for the entire package of powerplants (with the exception of unforeseen events that may be substantially important to safety).

13. The [criteria prepared] by the Unified Project backed by the Control Authority and adapted to the first site proposed will serve for the authorization procedure of the first powerplant. The procedure of "no objection" for plants coming after the first one will be based on an overall examination of the adaptations introduced in the plan for the first plant, in order to take into account the various characteristics of the proposed sites and of possible important evolutions of the safety rules. Thus, among other things, for all those parts (also important to objectives of safety and of health protection) not tied to the characteristics of the specific sites, ENEL can be authorized to place advance orders for the manufacture of components. This will enable the nation's industry to schedule the actual work load for the next few years on the basis of commitments over the entire program (contract program).

14. In application of all that has been set forth above, the criteria on purchasing (identification of subsystems) and of standardization, on the basis of which the national industry will have to prepare its own program for construction of the next powerplants, are to be specified. This program will have to bring to light organizational aspects and problems of preparation of the principal components with the pertinent time schedule for planning, manufacturing and setting in operation.

15. The main benefits are expected with regard to times in the planning and safety analysis phase (performed mostly once and for all) and in the individual unit testing phase. With regard to planning, the program reveals how preplanning of the main components affects development of detailed planning of the civil engineering work. Construction times of the powerplants are assumed to be 6 years for all the units on the basis of data encountered also internationally. With regard to testing times, it is assumed that the estimated definition of procedures and methods for evaluating the tests clearly determined before they start can make it possible to keep the time down to 1 year for the first two units. It has been assumed that this time can be reduced slightly later for the last two units under the plan.

16. In addition to the already mentioned advisability of reviewing the authorization procedures for nuclear plants covered by DPR 185/64 and always with reference to this decree, the competencies of CNEN are to be specified in relation to the competencies of other agencies assigned tasks of supervision and checking of plants under construction. Basic matters pertaining to existing regional competencies, assignment of functions with regard to approval (already tasks of EMPI [expansion unknown] and ANCC [expansion unknown]) and competencies of ISPEL [expansion unknown] in matters of health supervision in the field of nuclear energy, must be tackled.

17. A final aspect to be taken into account, predominantly institutional in nature, is the aspect of the position of CNEN, which should be such as to make possible conditions more adequate for carrying out the role assigned to it (see also the trend of the bills, under examination at present, on modifications to the law establishing the CNEN).

Appendix C

Infrastructures for Coal Transportation

1. The steam coal consumption estimated by the PEN amounts to 12-15 million metric tons a year by 1985 and will increase to 34-44 metric tons a year in 1990.

These amounts include ENEL's requirements for supplying powerplants converted to coal and new powerplants whose location is given in appendix A and non-ENEL plants (cementworks, brickworks, self-producers, municipalized companies, other industries).

2. Coal receiving ports can be subdivided depending on their capacity for handling colliers in accordance with the following classification:

Small ports able to receive ships with a full load up to 30,000-40,000 gross tons.

Medium-sized ports able to receive ships with a full load included between 30,000-40,000 and 60,000-80,000 gross tons or large-tonnage ships (80,000-120,000 gross tons) after a suitable lightening phase in a large-sized terminal.

Large ports, or coal ports, able to receive large-tonnage ships with a full load from 80,000 to 120,000 gross tons and over. Moreover, transshipment of coal can be performed in these ports to small-tonnage craft (20,000 gross tons) used for making small ports.

3. At present there are, in Italy, capabilities for handling (still for steam coal) fully loaded ships of a maximum of 50,000 gross tons only at ENEL's dock at La Spezia and the oven-coke dock at Vado. All the other ports can handle only ships with a smaller tonnage. On the other hand, ships with a gross tonnage of 100,000 gross tons, with a lightened load, have already been received at ENEL's La Spezia and Fusina powerplants. With regard to non-ENEL markets, the ports of Savona, Taranto and Naples can be supplied directly with ships of a medium and large tonnage. The other ports (La Spezia, Civitavecchia, Vibo, Bari, Ancona, Ravenna, Venice) can be supplied, once the unloading facilities have been developed, only after a phase of transshipment in a large terminal.

4. The new coastal powerplants scheduled are intended, in most cases especially for the largest powerplants (Piombino, Gioia Tauro, Brindisi or Taranto, Abruzzi), to be equipped with large receiving terminals. They can, at the same time, be used for lightening the load of ships with a medium and large tonnage, in order to make it possible to supply powerplants located at medium-sized ports, and for transshipment, in order to make it possible to supply smaller-sized ports.

5. Considerations of a logistic and economic nature suggest the advisability of constructing a first transshipment terminal on the Adriatic and a second one on the lower middle Tyrrhenian. The port of Trieste can be proposed for the first one, while for the second one, a choice can be made, in agreement with ENEL, between Milazzo, Gioia Tauro and Piombino. The port of Savona/Vado should also be developed.

6. The Trieste terminal, which can be built in a short time, between 3 and 4 years, could be able to handle large-tonnage ships, up to 150,000 gross tons, to supply, by land, users in northeastern Italy--and possibly Austria and south Germany--(railway or even coal pipeline), by sea the ports of the north central Adriatic, for amounts of 3 million metric tons for non-ENEL users, by means of transshipment and for similar amounts for ENEL by means of lightening the load or transshipment for powerplants on the upper Adriatic. There is a preliminary plan for construction of a terminal with the following characteristics:

Port handling capacity:

- two docks for unloading ships up to 150,000 gross tons
- one dock for transshipment to ships up to 40,000 gross tons
- one dock for loading lighters

Final movement capacity: 15 million metric tons a year.

Storage capacity: 2 million metric tons.

Investments: 150 billion lire.

The port improvement plan has already determined the area intended for the coal terminal, to be constructed in part by work of filling at sea. The terminal can be constructed in several time phases, depending on actual demand. A first phase of that terminal could be completed by 1985.

7. The terminal for the lower middle Tyrrhenian should be chosen on the basis of the construction priority of the ENEL powerplants to be supplied directly. Moreover, it is to be used for supplying ENEL powerplants by means of transshipment or load lightening or both and for non-ENEL supplying, including the ports of Sardinia and Sicily. This terminal, suitable for moving at least 10 million metric tons of coal a year, can be chosen between the ports of Gioia Tauro, Milazzo and Piombino. With regard to the port of Gioia Tauro, at present in completion phase, docks might be built for unloading coal from ships with a tonnage greater than 80,000 gross tons, in addition to a dock for reloading coal on small-tonnage ships. A coal wharf for supplying the local electric powerplant is in process of executive planning by ENEL in the roadstead of Milazzo.

This wharf will have a capacity for handling ships up to 120,000 gross tons on one single docking. This wharf could be supplemented with the infrastructures needed for reloading coal on small- and medium-tonnage ships. It is possible to construct docks for unloading ships up to 150,000 gross tons and docks for transshipment to coasting ships, in the roadstead of Piombino, which might be involved in an increase of traffic for the present local users.

8. Expansion of Savona/Vado is necessary for supplying the ENEL powerplants at Vado, Bastida Pancarana and Chivasso, and also the remote heating plants in Lombardy and Piedmont and non-ENEL users in that same area.

9. A preliminary study has been made for development of the port of Savona and for linking the dock with the S. Giuseppe di Cairo railway yard by means of a conveyor belt replacing the present railway line. Executive planning for expanding the oven-coke dock at Vado is in progress together with the studies for the port of Savona. Once authorization has been obtained, work can be completed within 2 years.

10. There is a study-proposal pertaining to a variant of the present improvement plan for the port of Vado, in which a port structure for handling colliers is provided. Because there are no areas available for coal storage in the port zone, use of the S. Giuseppe di Cairo storage yard is provided for with a link by conveyor belt that would cover 50 percent of the entire run (8 kilometers) on a newly determined layout (8 kilometers) over the areas of the existing cableway. The estimated technical time is 5 years for achievement of the Vado "complex."

11. The two alternative projects of Savona and Vado might be made compatible, if they are carried out in two different time phases. First phase: development of the port of Savona (3 years), in order to satisfy as soon as possible the needs of the north Italian market (ENEL powerplants at Bastida Pancarana and Chivasso), the non-ENEL market amounting to something on the order of 6 million metric tons a year, and expansion of the oven-coke basin in Vado to make it possible to move 3.2 metric tons a year.

Second phase: completion of the Vado terminal to meet the future increasing demand for coal in the long term.

12. In the ports (see point 3) for covering the non-ENEL requirements capable of handling ships with a tonnage varying from 10,000 to 40,000 gross tons supplyable after transshipment, there are facilities for unloading and moving coal with varying and, at any rate, limited capacity.

Most of the cases do not have adequate storage areas and some of them are completely lacking in storage facilities. Studies are now being made to improve the receiving, moving and storage facilities for coal intended for non-ENEL consumption.

13. Transportation within the territory, by a link between the coal reception ports and the users, has different connotations for the non-ENEL market and for the ENEL market.

14. The non-ENEL sector, consisting predominantly of users with a low unit consumption widely distributed within the territory, has, in most cases, a need for highway transportation. Railway transportation is advantageous only in cases of long distances (over 100 kilometers), high traffic volume (greater than 100,000 metric tons a year) and already existing railway networks and connections justify their use. The results of a detailed study show that of 5.8 million metric tons in 1985, only 1.6 metric tons can be moved profitably by rail. This movement increases to 2 million metric tons in 1990, in view of a total demand of

of 9.4 million metric tons. More than 60 percent of this traffic is destined to develop in northern Italy through the ports of Savona, La Spezia and Venice. Coal movement by truck, although sizable on the whole, does not seem to give rise to special traffic problems, because it is distributed over short distances and in a large number of directions.

15. The ENEL powerplants with a high unit consumption located inland (Bastida, Chivasso and a site in Umbria) can be supplied only by rail by means of a programmed traffic with considerable volume and intensity. An examination of the load of the railway network reveals that the Cairo Montenotte-Alessandria line, connecting with the Padua Plain, is a particularly critical route for shipments coming from the port of Vado/Savona. Development of the non-ENEL market by 1990, completion of ENEL's Bastida and Chivasso powerplants and the possible implementation of remote heating projects make an expansion of the railway line, or still better its possible doubling, necessary on that route. Excluding the line indicated above and the possible supplying of coal for the powerplant in Umbria, it seems, on first examination, that for the rest of the nation's territory, the anticipated rail traffic should not involve especially great problems.

16. With regard to river transportation, there are preliminary studies pertaining to the transportation of coal on the only Italian waterway that can be considered seriously, namely the Padua waterway (Po and associated canals). The indication emerges from those studies that, at present, very modest movements can be made on the Po. With regard to the canals, the Fissaro-Tartaro-Bianco [White] Canal system, close to completion, takes on special importance. For increasing the capacity on the Po, it will be necessary to provide for an adequate straightening of the river with work needed for making its maintenance and reliability of navigation constant. Improvement of the river routes should, at any rate, be included in a broader context that will take into account both the movement of coal and other bulk cargo. From that point of view, the possibility also comes up of establishing a point that could be located in the area of the Po delta or of the lagoon for reloading river barges for supplying users in the Padua hinterland.

Appendix D

Urgent Actions for Placing the Caorso Nuclear Powerplant in Operation

1. Absolute priority in the scope of the initiatives for making the supply of electricity adequate must be assigned to the measures required for placing two large plants in commercial operation by the end of November 1981: the Caorso nucleoelectric powerplant (840 megawatts electric) and the fuel-oil-fired powerplant at Porto Tolle (1,280 megawatts electric) for the first two units. It is a question of having an sizable contribution of power in the supply of electrical energy for the winter peaks. With regard to Porto Tolle, the difficulties that had prevented the powerplant's supply and therefore its going into operation up to now have been removed with recent agreements with the local authorities.

2. Specific action programs have been prearranged for the Caorso nucleoelectric powerplant, in coordination with all the agencies concerned and consistent with rules for safety and protection of the environment. The nuclear tests, arranged by CNEN, were performed in a series of phases and were completed on 2 May 1981 with the endurance test. The test results were examined and approved by CNEN

on completion of each individual phase. There still remains a series of problems, identified by CNEN, whose solution is indispensable for a favorable opinion on issuance of the permit for commercial operation by the Ministry of Industry.

The pertinent actions, already undertaken, are summarized in outline form in the accompanying diagram.

3. By 31 July 1981, a period of testing under power had been carried out for purposes of revealing the data requested by the control authority (CNEN-DISP). Structural inspections of the primary circuit will take place in the next 3 months up to 31 October 1981. Performance of anything else requested by the control authority will be carried out.

4. For the purpose of developing the action of superintendence at the Caorso plant in the forthcoming period of startup and in order to make regular operation of the plant possible in the shortest possible time, an intervention assigned to that undertaken was decided on. The ad hoc group that will avail itself of the organic collaboration of Ansaldo Mechanical will perform the following tasks, among other things:

Monthly meetings with the Consultative Committee of Experts for the Caorso Powerplant, open to the OSL [Workers Union Organizations].

Periodic meetings with the social forces and in particular with the OS [Union Organizations] of the workers.

Supervision with regard to problems pertaining to filling the staffs for operating and maintaining the powerplant, to bringing the workers professionally up to date and to other organizational aspects.

5. With regard to the organizational aspects, it is necessary to put in final form the documents that exist in provisional form. Their completion consists essentially of an accurate work of revision and editing. Incorporation of the personnel of the powerplant is also in progress as well as review of the Outside Emergency Plan in agreement with the local authorities. In addition to the above, it is necessary to perform work of maintenance and adjustment to ensure the greatest degree of readiness of the plant for resumption of operation.

6. The size of the problems still pending, in part ascribable to the turnkey system of supply for the Caorso powerplant, and the actions already started for solving them make it possible to predict that the Caorso powerplant can be in normal operation before the 1981-1982 winter peak, in a state of complete safety.

[Tables on next page]

Table 2A: Coal
Recapitulation of Investments
(billions of 1980 lire)

<u>Investments</u>	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Mining activity	500	1,350	1,850
Italy	100	250	350
Abroad	400	1,100	1,500
Sea transportation	100	650	750
Ocean-going ships	100	550	650
Coastwise ships		100	100
Receiving infrastructures	200	400	600
Distribution	300	300	600
Thermoelectric powerplants	280	7,520	7,800
Synthetic fuels and coal-oil	200	1,000	1,200
Italy	180	820	1,000
Abroad	20	180	200
Total	1,580	11,220	12,800
1981-1985 PNRE research expenditure			412

Table 2B: Nuclear Energy
Recapitulation of Actions
(billions of 1980 lire)

<u>Actions</u>	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Powerplant construction			
Construction of plants	1,100	8,000	9,100
Development of capacity of the industrial system	490	720	1,210
Fuel cycle	350	860	1,210
Development of safety technologies and control activities	470	900	1,370
Total	2,410	10,480	12,890
1981-1985 PNRE research expenditure (including fusion)			613

The investments referring to CNEN activity are, for the first 5-year period, the investments of the plan decided on by CIPE, expressed here in 1980 lire and including administrative expenditures.

Table 2C: Natural Gas
Recapitulation of Investments
(billions of 1980 lire)

<u>Investments</u>	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
In Italy			
Support for Algerian gas	750	—	750
Development of methane pipeline network	300	1,000	1,300
Urban distribution network	500	1,500	2,000
Storage developments	50	100	150
Turbogas powerplants	180	100	280
Abroad			
Algeria-Italy gas pipeline	300	—	300
Infrastructures for developing imports	100	2,100	2,200
Total	2,180	4,800	6,980

Note: Mining investments for working new deposits and the research and development expenditures included in investments for oil are not included here.

Table 2E [2D missing]: Hydroelectric Energy
Recapitulation of Investments
(billions of 1980 lire)

<u>Investments</u>	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Construction of new powerplants, reactivation of deactivated plants and small powerplants	1,200	3,900	5,100
1981-1985 expenditures for PNRE research			8

Table 2F: Geothermal Energy
Recapitulation of Investments
(billions of 1980 lire)

<u>Investments</u>	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Plants for the production of electricity and for utilization of low-enthalpy fluids	300	700	1,000
1981-1985 expenditures for PNRE research			60

Caorso Nuclear Powerplant
Schedule of Activities for Issuance of Commercial Operation Permit

Activities	July	August	September	October	November	Notes
Administrative Aspects						
Organization of support of powerplant	0	X				
Completion of powerplant staffing	0					X
Personnel training program	0					
Powerplant record file	0					X
Quality guarantee program	0		0		X	
Updating technical specifications, operation manual, operating rules		0	0	X		
Technical Aspects						
Tests of recirculation circuit	0		X			
Anchorage	0					X
Primary circuit inspection (ITS [expansion unknown])		0			X	
Checking turbine for steam leaks				X.....		
Setting up of emergency control center					X	
Maintenance, checking and general adjustment of powerplant					X	

Performance of general test of emergency plan before the end of October

Legend: 0 = submission of documentation to CNEN
X = Completion of activity

Table 2G: Renewable Sources and Substitute Fuels
Recapitulation of Investments and Appropriations for Incentives
(billions of 1980 lire)

	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Solar energy			
Low temperature	200 ¹	800 ¹	1,000
Concentration distribution systems	10		
Tower plants			
Photovoltaic conversion	50	120 ²	210
Wind energy	10		
Biogas from biomasses	20 ³		
Energy from wood	40	150	190
Substitute fuels			
Total	330	1,070	1,400
1981-1985 expenditures for PNRE research			265

¹Represent the part of incentives provided by saving and rational use of energy in the civil and residential sectors pertaining only to low temperature applications of solar energy.

²The state of development of technologies and of their applications and also of the degree of adjustment of the budget that will be attained in the 1981-1983 3-year period make a definite evaluation of the amount of appropriations needed after 1983 impossible. The figure given is, however, for guidance.

³These appropriations for incentives are appropriately coordinated with the activities already scheduled for zootechny (Law Number 984 of 27 December 1977).

Table 2H: Electricity Transmission and Distribution
Recapitulation of Investments
[billions of 1980 lire]

	<u>1981-1983</u>	<u>1984-1990</u>	<u>1981-1990</u>
Energy transmission and distribution	3,500	8,500	12,000
Rural electrification	500		
Total	4,000	8,500	12,500 [sic]
1981-1985 expenditures for PNRE research*			167

*including Lmdi [expansion unknown] 40 for research on systems and components for generating electricity.

Table 2I: Saving and Rational Use
Recapitulation of Appropriations for Incentives
(billions of 1980 lire)

	1981-1983	1984-1990	1981-1990	PNRE 1981-1985
a. Saving in industry ¹				
Energy diagnosis service	3		3	
Information to industry	5	3	13	
Training program for experts and technicians in energy management	12	12	24	
Demonstration projects and dissemination of results obtained	30	30	60	
Incentives for energy saving investments	690	1,610	2,300	
Subtotal	740	1,560	2,400	400
b. Saving in the civil sector	540	1,440	1,980	250
c. Saving in agriculture				
Experimental and demonstration projects on farms ²	20	20 ²	40	
Dissemination of results and technical assistance	30	30 ²	60	
Subtotal	50	50	100	15
d. Saving in transportation				
Development of motor vehicle prototypes and their components with high energy efficiency and their initial industrialization	500	900	1,400	
Development of industrial vehicle and bus prototypes and their components with high energy efficiency	200	350	550	
Development of components for other transportation means (ships, aircraft, trains, and so on) with high energy efficiency	150	320	470	
Improvement of the energy efficiency of all motor vehicles, buses and industrial vehicles	80		80	
Development of the recycling of deactivated vehicles	90	210	300	
Expenditures for developing energy efficiency control structures	60	140	200	
Subtotal	1,080	1,920	3,000	410
e. Cogeneration and remote heating	150	350	500	
Total	2,560	2,420	7,980	1,075

¹The above amounts include the appropriations provided by Law 673 and Decree-Law 2383 and exclude appropriations pertaining to distribution of renewable sources.

²The financial commitment required by this demonstration plan, amounting to about 20 billion lire, will be assumed on the budgets of the ministries concerned and also by the agencies already involved in the plan.

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